THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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A SUGGESTION AND A WARNING.

COL. ARMSTRONG in his review of the national industrial situation, which is abstracted on another page, though he indicates certain signs of industrial revival, declines to lay himself open to the charge of being an optimist, and perhaps that is as well, seeing that he is head of an industrial organisation which lives on orders and not on appearances.

There are two points of special interest that we select for mention here. One is his suggestion that strenuous efforts should be made to develop new markets within the Empire, carrying with it the recommendation that in the coming year (when, by the way, Sir Eric Geddes will be president) a strong committee shall assemble and consider whether a joint scheme (operated either by individual trades or by trades collectively) can be devised to stimulate our foreign trade. He goes so far as to invoke some support from His Majesty's Government, since assistance in such a cause would in a measure be reproductive and "would serve to lighten the burden of unemployment." Here there seems to be an opening for co-operation with the Trade Commissioners and a live Department of Overseas Trade. There were rumours current years ago that the F.B.I. preferred to go "on its own" in such matters, but whether they were correct or not, the spirit of the moment seems to favour a policy of co-operation.

Col. Armstrong's other point was a warning to his members that very strenuous competition would be coming from Germany. Lately German schemes have been perfecting for collective selling abroad and for jointly undertaking complete contracts. He added: "I am told that they have brought such organisation to a high standard of perfection and as soon as they can establish some stability in their finances, under conditions favourable to themselves, we shall find that they have organised to our detriment." The most natural observation in reply to such a forecast would be that "to be forewarned is to be forearmed." Surely if British manufacturers in so large an organisation know that Germany has organised to British detriment we are not going to be deficient in our own organisation measures! We are aware that there have been many consolidations of interests effected here which ought to be able to put up an effective opposition, and there have been many proposals advanced for electrical and other co-operative foreign trade movements. We believe that some of our large electrical companies are able to make a good fight against any comer, also that many smaller concerns making specialised lines know what they are about, but Col. Armstrong's warning may well serve to set electrical firms generally thinking whether they have done all that lies within their power, in comparatively impoverished times, to be quite ready. We hope that trade associations allied to the F.B.I. are not so occupied with less important matters that they will lay us open to the charge later on that we were apathetic while Germany was preparing. We hope also that Col. Armstrong's words will not pass unheeded by our municipalities which are tempted to place electrical contracts where they cannot benefit the British workman.

Christmas and Trade.

As we approach the Christmas season there is more of the spirit of hopefulness abroad amongst us than has been noticeable lately. The attractiveness of shop windows, the brightness of the stores, the purchase of Christmas gifts, and the atmosphere of goodwill have a healthy effect, but while that is so they are powerless to divert our attention from the unsatisfactory industrial situation, which deprives millions of our people of the full enjoyment of Christmas amenities; indeed, the merriment of the Christmas shoppers and the boisterous happiness of their juveniles do not harmonise with the instrumental and other appeals of those who ask an alms in almost every main thoroughfare. It were heartless to pass over this feature of the present position, for deprivation and distress are the inevitable consequences of unemployment as things exist to-day, and while we are reluctant to favour indiscriminate giving, we make an appeal to those who have enough and to spare to loosen their purse strings a little more than usual, thus doing their bit to reduce the prevalent suffering and discontent.

Unemployment is a matter that will inevitably remain with us in a considerable measure for some time. We sympathise with and cordially approve of every effort, whether by Government or by private interests, to deal with it practically by making useful work, but we should be acting altogether against our editorial conscience were we to hold out hopes which might have no actual foundation. There is plenty of reading-matter in the Press to indicate that trade is improving, and the placing of orders for railway electrification, for new ships, for power plant equipment, and so forth, should mean employment for additional thousands of workers in a very short time, but the Prime Minister's simple answer in Parliament in regard to the question of insurance by industries against unemployment was one which showed courage and a determination not to ignore the facts. He stated pretty definitely that the matter could not be settled by Parliament next year. It has been discussed at industrial meetings for years past as one of the solutions of the problem, but when trade is unsatisfactory and industrial companies are already so loaded with taxation that they, like Parliamentary candidates, don't know where they are, it would be madness to place upon them a new burden, the extent and effect of which are quite unknown. If taxation is reduced in the spring, as we trust it will be, and if trade continues to revive until then, with the prospect of further improvement as a direct result of taxation revision, the day for such schemes will be brought nearer. Information is being collected under Government auspices just now, but this is only a preliminary measure which is essential to the consideration of practical proposals by industrial experts and legislators. We hope that anybody who can help to make this study complete will not fail to contribute his quota, for, difficult as it is and must be, it seems to be as promising a *theory* as any that we have seen advocated consistent with the maintenance of the present industrial system.

The new work that has been put in hand, or is being placed out to contract shortly, will afford an immediate relief to the situation, and when house-building can again get on to an economic basis, hundreds of thousands of men should find work, but it is general trade activity which is required to cure idleness effectively, and we wish to repeat our recent advice that those who are responsible for the Governmental encouragement of our overseas trade should proceed with courage and expedition to carry out the duties and obligations that their positions impose upon them. The development of inter-trading relations between the Mother Country and the Empire must not be prevented by anybody who thinks more of his own Civil Service skin than of the stomachs of the community. Those who have it in their power to foster or direct the course of such trade should not be held by a leash of red tape, hands tied, initiative limited, and enthusiasm chilled when they see clearly enough that they could, if permitted, direct business to the Homeland in its time of industrial need. It is conceivable that the trading community would provide a new broom to sweep the hinderers into the Thames—and after rescue would adopt the British orthodox custom of promoting them out of harm's way!

We are pleased to see in *The Times* a letter from Sir Wm. Joynson Hicks, Parliamentary Secretary to the Department of Overseas Trade, in which he dwells upon the purchasing power of the Empire, and shows that he recognises the value of an extended Trade Commissioner Service in Canada and India for keeping the surplus purchasing power of the Empire within the Empire itself. Sir William pays a tribute to the wisdom of his predecessor, Sir Lloyd Greame, the present President of the Board of Trade, in arranging for these two additional Commissioners. We are glad to read that Sir William has been convinced during the short time that he has been in office at the Department of Overseas Trade that "in the extension of the Trade Commissioner Service lies one of the most practical methods of strengthening the economic links between the various portions of the Empire." We have expressed this view so frequently that it is needless to dwell upon it now, save to hope that Sir William will have adequate backing in high quarters in carrying out his ideas, so that the trade and industry of the Mother Country may be watched over by a Commissioner Service which shall be adequate in number of officials, and representative of British experience, personality, tact, freedom, and all the other good qualities which together produce a truly worthy Ambassador of British Trade. For ensuring satisfactory service from men of this class let Civil Service bands be snapped in the interests of the community which calls for work to yield employment and —bread!

The South American Market.

South America has long been regarded as a most promising market from the electrical and engineering standpoints. British prestige has stood very high for very many years; we were doing a large trade there when competitors were practically non-existent, and we were heavy investors in all sorts of enterprises which were essential to very early development. The various States felt in varying degrees the effects of the European war, and we could not provide many of the things that we had been in the habit of supplying, though they were sorely needed. Depression has hung over South America for several years past, but there are signs of most marked improvement, and before long there should be a considerable addition to the requisitions upon British manufacturers. Now, if there is anything that we regard as the paramount duty of this "Tranquillity" Government it is the stimulation of foreign trade; therefore it comes to us as a most welcome sign of practical Parliamentary interest in this connection that a number of members of the House of Commons who know the present position of affairs in South America, have come together in a group with the object of keeping in the forefront the possibilities of the Government doing something to help. According to *The Times*, a number of members paid a visit to Brazil during the recess, and they have returned with optimistic views as to the possibility of re-establishing and extending British trade with markets which had perforce to be abandoned during the war. Already they have put a number of suggestions before the Government, and we trust that something tangible will result. Speaking generally from experience, we think that it is sound advice for trade to put not its faith in governments, yet we believe that the large number of members of Parliament interested in trading development and in engineering and construction work have it in their

power to do much toward quickening the speed of revolution of the trade wheel. It seems to us that one of the best things that Labour members could do would be to bring the full force of their influence behind the movement and accelerate the rate of progress in the interests of the army of workers and workless whose future well-being, like that of most of us, is bound up with the incoming of contracts from the overseas markets. Members of Parliament might be well occupied during the present recess in studying the Electrical Review and other trade papers that have given attention to world markets for years past. How many members of Parliament get their information from specialised trade journals? If ever they needed to study them they need it now.

Domestic Electric Consumption in Canada.

A study of some of the figures given in the annual report for 1921 of the Hydro-Electric Power Commission of Ontario, reviewed elsewhere in this issue, reveals the very considerable increase which has taken place during the last five years or so in the average number of kilowatt-hours per month taken by domestic consumers in the various municipalities supplied by the Commission. A general survey of all the figures gives the impression that the average increase for all municipalities is in the neighbourhood of 100 per cent. for the five-year period, and if one looks back seven or ten years the increase is undoubtedly very considerably more. The causes for this great increase are the rapid growth in the use of all kinds of domestic appliances and, within the last year or two, of electric cooking ranges and water-heaters. There is little doubt, from all indications, that the growth in the domestic consumption will be much greater in the next five years than it has been in the past five on account of the rate at which ranges and water-heaters are being installed. In Toronto at the present time something like one hundred electric ranges per month are being connected up; taking diversity into account, these ranges probably add about 1.25 kW each to the load on the system.

Another fact gleaned from a study of these figures, and one which is worthy of notice, is the remarkable uniformity in the monthly domestic bills, no matter what the price of electricity may be, for while the net cost per kWh ranges at the present time in different municipalities from 13.2 cents to 1.4 cents, the maximum range of the average monthly bills is only from $2.54 to $0.82, and undoubtedly most of the bills are from $1.00 to $1.25 per month, quite regardless of the price charged per kWh.

A Reflection for Christmas.

The coming of Christmas will, this year, interrupt an industrial dispute in the electricity supply industry. Is it too much to see in this an augury of a happy settlement when the matter is again taken up? The pause will not be unfruitful if even a modicum of the seasonal spirit of goodwill is allowed to be carried forward.

Mr. John Drinkwater wrote recently: "Although what we call the Great War has stopped, there is still raging in the world a war upon the issue of which the whole hope of mankind depends. It is a war between two kinds of people. Into two kinds of people all the active thinking part of the world may be divided, and those two kinds are the people who want to dominate their fellows and those who want to understand their fellows"—and Mr. John Drinkwater identifies Christianity with the latter.

1919 saw a new era in the electricity supply industry; a new method was tried in conducting industrial relations, one which relied on *understanding* instead of *domination*. Mutual understanding is the keynote of the Whitley system. That the new method has been an outstanding success in the industry goes without saying. That it is the right way no one can deny. An occasion has arisen which is putting it to the strain. But the trouble can only be successfully and rightly settled by this same method of working towards a mutual understanding. Perhaps this pause of an intervening Christmas-time may signally help in that direction.

Public v. Private Ownership.

In view of the reorganisation of electricity supply in this country, the revival of the long-standing controversy regarding the respective merits and demerits of public as opposed to private ownership, by the "Murray" report and the reply thereto by the Hydro-Electric Power Commission of Ontario (reviewed elsewhere in this issue), has an interest reaching beyond the American Continent.

The Commission was accused by Mr. Murray of recklessness in its methods of development, both from the engineering and financial points of view, and the report did not possess a single word of praise for the undoubted good which the Commission has wrought for Ontario, and therefore the Dominion of Canada.

Impartiality would not appear to be one of Mr. Murray's strong points, and the report needs to be considered with this in mind. The National Electric Light Association, from which he received his commission, is strongly against public ownership—or ownership by public bodies—an attitude due partly to interest and partly to the poor showing made by public ownership in the United States. Mr. Murray himself is apparently in complete agreement with the Association's view, for he commenced his investigations with a statement that he had "never subscribed to governmental ownership of electric utilities in the United States."

The Commission deals in a categorical manner with the report, and shows that many of Mr. Murray's comparisons are fallacious, for the reason that facts material to such comparisons are forgotten or ignored. He is accused of deliberate misrepresentation in one or two instances, and figures are given to support the accusation.

In the circumstances, Sir Adam Beck, the chairman of the Hydro-Electric Power Commission, can hardly be blamed for refuting in the strongest terms Mr. Murray's claim that his report was "based on an impartial and exhaustive study."

The I.E.C. Conference.

The British National Committee is to be congratulated on the result of the meeting of the Advisory Committee on Rating of the International Electro-Technical Commission at Geneva, which is reported elsewhere in this issue. The rating of electrical machinery is a very difficult but very important subject, complicated by local conditions and by the divergent views of manufacturers in the countries most directly concerned. The method of rating by fixing the ambient temperature at a high conventional value, and thereby setting an absolute limit to the ultimate temperature attained, is somewhat artificial, but has the advantage that it is of universal application, ensuring that international competition shall be conducted on a fair basis. In this country, however, the long-established practice of quoting for machines with an overload rating proved too firm to be superseded, and though the British makers were willing to comply with the ultimate temperature limits they desired an alternative rating. This object, thanks to the courtesy of their foreign *confrères*, has now been attained.

Once more, therefore, the value of the I.E.C. as a means of securing international agreement has been demonstrated. The importance of its work cannot be questioned, and it is to be regretted that its activities are hampered by lack of funds. We hope that as trade improves this difficulty will be removed. In such a matter broad views should be taken, and it should be realised that whilst contributions to the funds will not produce an immediate return to the donor, they will bear fruit in the long run.

D

ESTIMATING OFFICE ORGANISATION.—III.

By MAJOR J. C. CONNAN, B.Sc., A.M.I.E.E.

Labour Constants.—It has always been extremely difficult to estimate satisfactorily the cost of the labour to be expended on an installation. This is no doubt primarily due to the many external conditions affecting the work, but is also due to some extent to the prevalent practice of estimating for labour directly in £ s. d. rather than in hours of work and then pricing the hours. The former method, of pricing direct, may be satisfactory for certain classes of work, and is perhaps slightly more expeditious, but it pre-supposes that so many conditions are the same for all jobs that it is a wonder not more losses are made than is at present the case. It is very much more reliable, even if somewhat slower, and entirely to be recommended for all important work, to estimate the number of hours' labour to be expended on each item of work to be done, add all times together, and price, in order to obtain the total labour cost of the job. This can, however, only be done if certain standard conditions are assumed, allowances being made for all deviations from the standard, and labour units for each class of work, here called "Labour Constants," are used.

The time expended on a particular piece of work depends on: The man doing the work; the tools he uses; the conditions under which he works; and proper planning and inspection of the work to be done.

It is always pre-supposed that the man is skilled, an assumption which is not always well grounded. He may be a first-class conduit wireman, but extremely poor at casing and capping work, and if it is found necessary to use him for the latter work some allowance should be made for his lack of skill. It seems almost facetious to say that it is always assumed that the work will be done by British workmen. But in many of our Colonies this is by no means universally the case, and it is not safe to assume that the cost estimated for British workmen will cover the cost when Indians or natives are employed.

The tools should be in good repair, plentiful, and of the correct pattern for the class of work to be done. Although the workman is supposed to supply his own tools, it will often be found that his collection is by no means complete, and that in consequence a good deal of borrowing goes on. Wherever special tools or appliances are necessary, these should be provided by the firm in sufficient quantity to prevent any delay.

The conditions under which electrical work may have to be carried out are extremely various, more so perhaps than in any other trade. The building in which the work is carried on should be warm, extra time being given for work in unheated buildings in winter, cold storage rooms, &c., as well as in boiler rooms, heating rooms, or other places with excessive temperatures. It should be well lit, a point very often overlooked in electric lighting installations in winter, and allowances should be made for all work underground in mines, cellars, &c. It should be dry, free from steam which might obscure the workman's sight, and free from all noxious fumes such as occur in zinc works, chemical works, &c. The last condition should be specially investigated, as it might make continuous working for any length of time very difficult. The nature of the work should not necessitate that the workman has to get into cramped and awkward attitudes, nor that he should have to work in a dangerous position. On all country work, such as transmission line work, cable laying, or where the site of the job may be some considerable distance from the nearest town or even village, and the man may have a long way to walk, a certain allowance should be made for inclement weather, depending on the time of year. In the two former instances, the nature of the country, whether hilly or flat, will have to be taken into consideration. Interference from other contractors also frequently invalidates labour estimates. This can be avoided to some extent by careful planning, and in this respect much depends on the engineer, who should keep his gangs rightly proportioned to those employed by other contractors. Overtime should be avoided if possible. Apart from the fact that the quantity of work turned out is nearly always below normal, the quality is frequently below standard, and mistakes, with consequent re-working, common. When it is necessary to work overtime, it is preferable, though this depends on the class of work, to work the foremen overtime, letting them overlap into one another's shifts, but to employ a new gang of men.

Correct planning by the engineer responsible for the contract is extremely important. This not only means that standard methods of work, with which the workmen are fully conversant, should be employed, but that material and tools required should be ordered so as to arrive in the right quantities just when necessary. The happy medium between having a large stock on the site and none at all should be struck, for in the former case the losses due to wastage, exposure, and stealing are increased, whilst in the second case much time will be lost by the men being semi-employed. A condition which is also sometimes overlooked and which has a very considerable influence on the costs is the correct proportioning of the gang. This is of more importance on large contracts when the number of men is large, but in no circumstances should the number of foremen or leading hands be stinted. It is not only that there should be sufficient of them to efficiently supervise the men and prevent slacking, but also that one should be immediately available to give advice, where necessary, on difficulties as they appear, without neglecting his other duties. The proportion of labourers to skilled men should also be carefully watched to prevent skilled men wasting their time on unskilled work. Careful observation of the progress of other contractors and foresight on the part of the engineer will materially reduce labour costs and frequently prevent the necessity of overtime.

All estimating engineers should be given the opportunity of visiting the site and analysing the labour costs of work for which they have estimated. The procedure then adopted to formulate a service of Labour Constants is somewhat as follows:—The total number of hours as obtained from the time sheets (foreman's, wireman's, and labourer's time being kept separated) expended on a definite amount of work as obtained by measuring up, together with the general conditions under which the work has been done are noted. All hours (foreman's and labourer's) are then reduced to wireman's hours, giving the total equivalent wireman's hours for this piece of work. This is very simply done by increasing or decreasing the actual hours worked in direct proportion to the rate of wages as compared to the wireman's rate. Thus, the foreman's hours at 2s. 6d. per hour are equivalent to 12½ wireman's hours at 2s. The number of equivalent hours then required to do a unit of this class of work, say laying 100 yards of cable or running 100 ft. of 2 in. conduit, under the above conditions are then found and noted with full particulars on a card index. After some time a considerable number of these units will have been collected, but practically all for different conditions. By comparing these units with one another, making allowances to bring them into line with standard conditions, and plotting where suitable, a series of labour constants can be obtained. The analysis of further data should, however, not be given up on the completion of a series, but carried on so that the series may always be checked and kept up-to-date.

An example may make the method clearer:

The following figures were obtained whilst running 20 miles of trunk-line telephone cable, 450 pairs, 0.6 mm. dia., in plain lead, through hilly country. The weather was dry, but very cold, when the data were taken. The gangs varied from week to week, depending on how far the nearest village was. A tramway along the road was available.

Marking off.—Two labourers were employed running the line for the trench and marking the route every 10 ft. with a pick. They completed 700 yd. each in 2 hours 55 minutes.

Digging trench.—This was in a macadam road with sandy loam below and was 2½ ft. deep × 1½ ft. wide. An average of 105 labourers in a week of 52 hours dug 2.08 miles.

Laying cable.—The cable was supplied on drums each containing 250 yd., which were dropped at approximately this distance along the road from motor-lorries. Five men spent 32 minutes getting loaded drum from the side of the road, placing over trench, and afterwards removing empty drum to other side of the road. In order to prevent damage to the cable whilst pulling out, the 100 labourers were taken from the trench and utilised for pulling and handing along. Time occupied by men going from trench-digging, laying 250 yd. of cable, and returning was 15 minutes.

Protecting cable.—This was done by throwing in loose earth around cable and laying a slab of concrete 2 ft. ×1 ft. × 2 ft. along the top of cable before filling in trench. Slabs were put in heaps of about 80 every 50 yards from lorry, and five men took 65 min. to throw in earth and lay 80 slabs.

Filling in trench.—On this stretch of road five men filled in and rammed 194 yd. each per 8-hour day.

Removing surplus earth.—The cable ran along country roads bordered with fields, and a good deal of surplus loam was thrown on to the fields, however; two carts were kept continuously busy carting surplus earth to dumps. For the length of cable under consideration the run was 480 yd., the labour expended was 104 hours horse and cart, 104 hours carter, equivalent to 95 labourer's hours, and 20 hours labourer's loading. There were four foremen superintending the labourers, these were provided with two caravans, one being used as an office and the other as a store.

If individual units are to be made for each operation, the foremen's hours should be added in proportion to the total labourer man-hours expended on the operation. The foremen are paid 25 per cent. more than the labourers, and consequently 4 × 52 = 208 foreman's hours are equivalent to 260 labourer's hours.

—	Labourer's Hours.	Labourer's Hours equiv. to Foreman's Hours.	Total equiv. Hours.	Equiv. Hours p. 1,000 yds.
Marking off 2.08 miles ...	30.5	1.5	32	8.74
Digging trench ,, ...	5450	198	5648	1543.2
Laying cable ,, ...	39.5	1.5	41	11.2
Protecting cable ,, ...	370	13.5	383.5	104.78
Filling trench ,, ...	755	27.5	782.5	213.8
Removing earth ,, ...	155	4.5	159.5	43.6
Total	6800	246.5	7046.5	1925.3

Making joints.—The joints were not made by the firm laying the cable, and consequently the latter overlapped cable at the ends and filled in trench. About one month afterwards six gangs of jointers followed on, opening up and making joint. The gang consisted of three men, two jointers, and one assistant, and was equipped with tent and tools. Each joint took 49 hours to complete, and times were therefore 98 hours wireman's and 49 assistant's, equal to 135 jointer's hours per joint.

The figures given will be above standard on account of hilly road and very cold weather.

THE PROSPECTS OF THE COMMERCIAL ENGINEER.

By W. ANDER.

Many well-trained technical engineers are at present wondering as to the prospects in the commercial side of engineering. The work is hard, the competition very keen, and the necessary hours very long. In fact, no one works so hard as the commercial traveller. It should be distinctly understood that if the would-be commercial engineer does not remember that he is first and foremost a commercial traveller, and only incidentally an engineer, then disappointment and failure await him.

Each customer has his whims and foibles, and is a problem by himself; successful commercial work lies in understanding this fact and in working in such a manner that the customer can be persuaded that the plant one is offering contains all those little details which he has always sought, but never found; and that the sound design and skilled construction carried out at the firm's works render the plant the most serviceable on the market.

The prospective purchaser must never be contradicted flatly. Ask his opinion of the firm's methods as if you were asking a favour; then point out one by one the good points of the design, and request a summing-up from one who is an expert user. You will not only flatter his *amour propre*, but will gain a very keen insight into what he really wants; and that point understood is half the battle.

The largest incomes are made by men on commission, who pay their own expenses, and practically handle what goods they like. These men are born salesmen, and really work by getting to know the buyers or influential men in the firms they call on, and finding out what these firms require; they then offer them first-class goods in those lines, and will look at no firm who cannot give their friends the best of value. Such connections must needs start in a small way, and take years to work up. They often mean the handling of subsidiary goods, and not large impressive plants.

The most wretched returns are also made by men on commission, men who in most cases should not be out on the road at all, being temperamentally unfitted for such work. Between these two groups come the salaried men attached definitely to one firm. If that is a firm of standing their expenses are good, their work comfortable, and their standing undoubted. They seldom, however, net very large incomes. Such men are usually appointed from inside the firm's offices, or have served other firms in similar positions. An excellent method of training for such a position is to leave the works and drawing office by the time one is twenty, and take up a minor clerical position, study commercial law, the special theory on which the firm's and their chief rivals' products depend, and at least two foreign languages. By the time one is twenty-three a start can be obtained either with one's own firm or another doing similar work.

Before the war such men made from £400 to £800 a year by the time they were thirty or thirty-five. Much above the higher figure was quite unusual. Membership of certain clubs and societies must be maintained, and it is other than the rule for one's firm to pay these items.

Travelling in itself soon becomes monotonous and very tiring; many young engineers consider it a holiday; if they will but reflect for two minutes they will realise that if it is treated as a holiday there will be no time for business; and shortly after that, no room for the holiday-maker on his firm's staff.

Reports to one's firm have to go in every night, or at least three times a week; and this has to be done after one has called on people all day; that is, between, say 7 and 9 p.m.

Many firms who have insufficient trade in certain districts to warrant appointing one of their own staff as a resident agent, appoint an engineer to look after their interests along with his other work. This work is solely on commission, and should be entered into with some care. The fact that the firm is appointing an outsider to their own organisation shows that the possible returns are somewhat thin; thus, no work of this sort should be taken up unless an agreement is given to support the agent right throughout his district, and not to withdraw the agency without very considerable notice. Unless this precaution be taken, the agent may work hard for three or four years only to find that the connection he has built up is filched from him by the firm shutting down his agency and putting one of their own staff on the ground. Unpleasant as it may be to contemplate, this trick is by no means uncommon.

The agents and commission men can sell where and what they like as a rule. The salaried man cannot. The commission man may sell between two customers a steam crane, or an oil tank, and have the commission for himself. The salaried man dare not do this, as his time whilst out at his firm's expense is theirs, and any money he makes by cross sales of this description is the employer's, legally; most firms would insist on such commissions being handed over to them, and they could actually prosecute a man for failing to do so.

Another type of representative is often employed by the smaller firms and by makers of small speciality goods. They will offer a man, say, 15s. or £1 a week and a ridiculous commission. The salary will not cover two days' expenses at a decent rate of living, and the commission is too low to make up a reasonable income. Such a man is the firm's salaried servant, and must not forget the fact; an agent or a pure commission man can collect his principal's accounts, and deduct his agreed percentage before sending the money to the firm; the man on even 10s. a week salary dare not do so; he is a paid employé, and must not keep back his employer's money. A salary providing at least three days' decent living and travelling expenses, and nothing less than 10 per cent. commission, should be insisted upon if the goods are small articles.

This introduces the question of the commissions usually paid. Small accessory lines must carry a good commission, especially if new and not much advertised; in such cases not less than 25 per cent. should be paid to a man working on commission alone. If the goods are well-known, well-advertised, and used to a considerable extent, than 10 per cent. can be worked to, if the firm will grant exclusive areas to its travellers and agree to pay them on all orders coming from that district, whether through them directly or not.

One man known to the writer carried a very good and somewhat cheap soft gland packing; this was excellent stuff, especially for steam hammers; he also carried a proprietary belting. Before the war that man made over £1,000 a year clear profit. He worked solely on commission—on a 20 per cent. basis, paying all his own expenses.

Another man ran a well-known belt syrup, and would carry nothing else, though often asked to do so. He made £500 a year before the war, and whilst he was in the Army his firm paid him all commissions which came from his territory, and treated him excellently. Both men were good engineers, but were born sellers and knew the merits of their own and rival preparations from A to Z.

There is a class of engineering representative who has a very bad time of it; this man sells cheap jointing material, small electrical switches of the domestic type, of cheap and nasty design, lamps, or boiler compositions. Often he is refused a hearing and looked upon as a nuisance. Unless one can get the representation of the *best* in these small lines they should be left alone.

Large goods such as generators and motors, say of 100 h.p. and upwards, can be sold on commission on a 5 per cent. basis, and a good living made. If a plant costs less than £500 get 7½ per cent., if less than £100 get 5 per cent., and if below £50 insist on 10 per cent. Above £1,000, 2½ per cent. can pay, and 5 per cent. be very handsome.

The writer has sold boilers and generating sets on a 5 per cent. basis, and this allowed one money to save and invest; whilst 2½ per cent. in times of good trade gave a very comfortable living.

The "side line" is another snare for the novice. He thinks a side line will get him a sale where the main line is not wanted, and so will help to pay expenses. This is a fallacy unless the side line is offered at a good commission. Most side lines are put forward on absurdly low commissions.

Lines which will not pay a man to travel for all the year round will not pay him to take up. Every ten minutes spent on the side line is ten minutes robbed from the principal line, which can and does support one full time year in and year out. The writer has sold feed pumps and plunger pumps on a 5 per cent. basis when selling boilers, simply because people who use boilers also must use pumps. Boilers and generators, however, will not go well together; each is too big to allow adequate time for the other. Also, when a prospective buyer finds a man representing two or three lines not strictly cognate, he thinks that the man is no expert, and that he is not receiving expert advice and help in any of the matters handled. This, of course, is fatal to doing business.

The above notes have been put together from the records of a by no means unsuccessful experience in selling engineering plant. The plant handled comprised engines, dynamos, motors, boilers, air compressors, and even at times jointing and packing, and orders for special castings. Naturally much was picked up from other men on the road.

A representative must never be beaten, never pessimistic or complaining, and always ready to humour his customer. A man who lacks tact, who cannot stick at work day after day without supervision, or who is attracted by prolonged lunches, is better off the road.

Electric Vehicles in the United States.—An improvement in the demand for electric trucks was reported during October. The leading makers state that sales are slowly increasing, and leading authorities on automobile insurance recently granted a further preferential rate in favour of electric trucks. As a result, the cost of public liability and property damage insurance for electric trucks is now 25 per cent. lower than for other types of motor vehicles. Fire insurance rates also are much lower, depending on the class of service and on the company issuing the policy.

The electric vehicle show held in October in connection with the Electric Exposition at New York attracted wide attention. The electric truck parade was one of the most popular features of the show.

The "slogan" contest has aroused much interest throughout the country; replies have been received from every State in the Union. The most unexpected development in connection with the contest is the large number of testimonials, with slogans, received from large users of electric trucks.

The Electric Motor Truck Association of New York has established a school of instruction for drivers; the Association plans to issue certificates to those who pass the test at the end of each course.

The National Electric Light Association will hold a meeting in New York on June 4th to June 8th, 1923, and an exhibition of electric vehicles and accessories will be held at the same time.

Four electric truck and passenger cars, valued at 7,456 dollars, were exported during August.—*Reuter's Trade Service* (New York).

Photo-Telegraphy.—M. Edouard Belin, inventor of photo-telegraphy, gave an interesting lecture in Paris on December 7th, in which he demonstrated the possibilities of seeing at long distances by means of a telephone wire. His invention is based on the property of the metal selenium of varying its resistance to electric current according to the degree of light to which it is exposed.—*Reuter* (Paris).

A REMARKABLE PROBLEM.

By GEORGE E. MOORE.

I WANT to "utter a note of warning." The remarkable problem I am going to set forth is absolutely true in origin. I am telling you this because I have had a lot of trouble with people who simply will insist upon taking some of my lightsome technical efforts in too literal a vein, when many a character or situation is really a sort of composite one—a blended product of experience with, now and again, a little imaginative seasoning added. Not long ago I met a chap who insisted (and persisted) on a criticism of my "Warm Work on Meters." I let him go ahead because he's the only fellow I've ever met who honoured me by buying a copy of the ELECTRICAL REVIEW on account of an article of mine appearing therein. "Now," he said, "in your article (which wasn't at all bad) you talk about the Chief going 'on the prowl.' What I can't make out," he went on, "is, why your boss didn't boot you out when you wrote about him doing that!" A specific "*him*," mark you! My candid friend was considerably taken aback when I informed him that my Chief had immediately adopted the phrase in question.

While I disclaim any distinct local or literal meaning in my jocular efforts, I would like to make an exception of the present one, because the incidents are really true. The scene of action is laid in a boarding-house. This fact will at once rouse the understanding interest of all the past and present "rolling stones" of engineering—their name is legion, and a poet is yet to rise and pen an epic to their cast-iron digestions, stout hearts, and courage in the face of inhospitable new jobs. Let me now throw upon your mental screen the characters involved in "A Remarkable Problem":—

The Landlady.
Her Cat.
Abbey (an electrical apprentice and "billet-pal").
Myself; and
The ELECTRICAL REVIEW.

The chief parts are played by the cat and the ELECTRICAL REVIEW. I need not introduce the latter, but the cat requires a few words, and I cannot do better than quote the Landlady: "She's lovely, you know. She's more like a bairn than a cat. She sits on her little stool, and she looks at me, and she listens to all I've got to say, just like a little Christian. And I wouldn't give her away, no, not for a crown of gold I wouldn't." I might add that while I was in those "digs" no one ever knocked at the front door and offered a crown of gold (or even tuppence) for the cat; still, you may take it from me—that cat was certainly a remarkable feline.

To my friend Abbey belongs the credit for discovering the strange fact anent the cat and this journal. Really, it is astonishing how keen he is in spite of attending a technical college. This is what he found: *Whenever either of us began to read the* ELECTRICAL REVIEW *the cat at once and with remarkable decision ran from the room.*

There you have the problem. For a long time it baffled us. We never did solve it by theory. Abbey, who at that time was very keen on Differential Calculus, was hopeful of working it out mathematically, and thought that when he started on integral stuff he would make short work of the problem. In the meantime he was going to consider whether there was some sort of repulsion effect—he had not yet forgotten the catskin experiments at school. For a time we argued about the Johnsen-Rahbek effect, which had just been published. I was inclined to suspect a subtle connection between the cat and this journal; so far as I could discover, the animal had never been within two hundred miles of Ludgate Hill, and while the cover of the paper is blue, blue things, as such, had no effect upon the animal. Everything pointed to the cat being able to read (it was a very intelligent cat, remember), and it was possible that its tender feelings had at some time been upset—perhaps by that account of a tasty rat being shockingly treated by h.p. switchgear; its retirement from the room might even have been indicative of contempt.

Well, all these fanciful theories went by the board when we found out the annoyingly simple solution. It was in this wise: One day, after a short homily of twenty minutes or so on the cat's good qualities (with particular regard to its table manners), the Landlady, with due deliberation and a few parting shots, left the room, when the cat at once jumped on the table and began to chew the ferns there. The Landlady presently returned, spotted the cat, *picked up the* ELECTRICAL REVIEW, *and opened an offensive*, the cat at once retiring to a strategic position among the crockery in the kitchen. And there you have the solution to the problem which had baffled us. You see, the ELECTRICAL REVIEW was merely a crude weapon of offence, a handy form of corrective—nothing more.

However, we finally contented ourselves by finding it possible to introduce into the matter a little scientific theory. For it seemed that the problem, after all, brought in at least one of the principles of Relativity. (I am sure that Prof. Einstein will welcome this addition to his collection of figurative explanations.) There was the Landlady, full of ire and pounding along at the rate of four or five miles an hour, attempting to target an offending feline retiring at fifteen miles an hour with a projectile of variable stream-line and unknown velocity. From the Landlady's point of view it was highly desirable that the projectile should definitely reach the moving objective with considerable impact; the cat naturally considered such result to be by no means laudable, and endeavoured, by due acceleration, to obviate so disturbing a calamity; while the third factor—a rather weighty one, you know—was the ungovernable flight of the ELECTRICAL REVIEW. The impact duly took place, but it did not coincide with the impact calculated by the Landlady. While the cat continued its scot-free departure there would be heard the ominous crash of some cherished heirloom, and then the fluttering collapse of the ELECTRICAL REVIEW.

The ensuing domestic complications were of such a nature that dinner would inevitably attain an astounding degree of indigestibility, and as a discussion of the latter factor hardly lies within the realm of a journal like *this* one, I suggest that we now "take her off the bars" and shut down.

An Economical Wood Fuel Plant.—By the substitution of gas engines for steam engines at the Lonely Mine power plant, Southern Rhodesia, a saving of £3,000 a month has been effected. The boilers of the old steam plant were fed with wood from the local bush, requiring 3,000 cords per month. In this way the bush had been cleared to a radius of 11 miles. The cost of power production led the management to consider the employment of electricity supplied by gas-engine driven alternators. Three 300-b.h.p. "Premier" engines and a 225-b.h.p. engine were therefore installed, together with a 1,400-h.p. gas plant in four units. The three large engines were coupled to 250-kVA, 525-V, .8-p.f. alternators, and the other to an air compressor. During a test run of 24 hours under 80 per cent. of full load, the engines developed 239 b.h.p. each, and the alternators supplied an average of 477 kW. The fuel had an average moisture content of 13.5 per cent., and the consumption per kWh worked out at 3.575 lb., equivalent to 3.09 lb. of dry fuel, a figure about 4 per cent. below the makers' guarantee. As a result of installing this plant, the monthly fuel consumption has fallen 80 per cent. to 600 cords. The gas-producing plant was supplied by Messrs. Crossley Bros., Ltd., and the engines by their associated firm, the Premier Gas Engine Co., Ltd. The S.A. General Electric Co., Ltd., provided the alternators.

ELECTRO-FARMING.—III.

Requirements for Motor Design.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

As in any other problem, where the application of electricity is considered, the electro-farming question is one that must be dealt with in a sane and common-sense fashion. In the early stages there is a tendency to attempt to equip farms electrically very elaborately, regardless of cost, and without considering the temperament of the personnel, who are to use the machines. It is the author's experience that electrical engineers, who know nothing about the subject, sum up the problem as the very simple one of belting a standard electric motor to a countershaft, and then driving existing types of farm machinery (already arranged for belt drive) from this countershaft. A comparison with such businesses as the printing trade, or the cotton manufacturing trade, will show that in the course of years the electric drives have become very specialised, and call for the services of specialised electrical engineers. The author maintains that similarly it will be necessary to modify the design of the electric motors and also of the drives, specially to suit farming conditions and requirements. In point of fact, though sad to relate, there is not an electric motor made in England that is as suitable for work on a farm as many Continental makes. After all, this is easily explained by the fact that the English demand for electro-farming motors is not yet very great. Moreover, the English farmer who uses electric motors (and these are already a very considerable number) docilely takes for granted the type of electric motor that his friend the electrical engineer provides for him. As he finds out its drawbacks he ascribes them, for lack of better knowledge, as the necessary but unfortunate accompaniments of that strange beast "electricity." On the Continent, however, so many thousands of electric motors have been employed and have been in use for so many years that the farmer there really knows what is required, and consequently asks for it and sees that he gets it. In the course of a recent visit to the Continent, the author came across an electric motor on a farm that had been in regular operation for the last twenty-five years, and even then it was purchased second-hand. Twenty-five years' experience of electric motor driving on farms is a pretty considerable period, and one that is bound to test out the qualities and deficiencies of electrical operation.

A farm labourer is truly a jack of all trades, for he is continually changing his work with the seasons of the year, and even with the hours of the day. Hence a man just about gets used to keeping a belt drive in order, when he goes on to other work; on returning to the belt-driven machine after an interval of a few days, he finds the belt too tight or too slack, or it breaks down.

He seems then to forget almost all he had ever learnt about the care of belting. The result is delay, both to his own work and to the work of his fellow labourers. This simple illustration is indicative of some of the difficulties encountered in introducing new ideas on a farm. It is not generally realised that, even at the present time, it is one long fight to get any machinery used at all, the prejudice and lack of skill of the employés is so great. Again, as these men are not accustomed to machinery, they are apt to let it go to rack and ruin, all due to that neglect of the "stitch in time" which saves repair bills. In comparison, the horse is largely a self-repairing piece of apparatus, whose ordinary breakdowns are understood; when they are more complicated, the veterinary surgeon is an accustomed friend. On the other hand, the repairing engineer is an unknown stranger, with a reputation for charges, if anything, on a greater scale than those of the proverbial plumber.

The foregoing reference to the conditions that have to be allowed for in the design and application of electric motors shows clearly that something a little out of the ordinary will have to be provided for by the designer.

The mechanical and electrical portions of electrically-operated farm machinery should be so designed and constructed that they will require overhauling only after long periods of working. Most farmers have had trouble with the ordinary agricultural implements, and are therefore rather prejudiced against trying new machines until someone else has proved them to be successful.

One of the most common troubles experienced with electric motors on farms is the damage due to moisture, whether in the form of rain or condensation. Only by special design can this defect be overcome. The motors should be drip proof, *i.e.*, shielded from vertically falling water or dusty material.

Ball-bearings should certainly be used on all motors intended for agricultural purposes. The ideal of simplicity is in general reached with well-designed motors of the squirrel-cage type, in which the stator windings have been properly protected both from mechanical injury and from moisture.

In most cases it will be found preferable to incorporate the starter as a part of the motor. If this practice accomplishes nothing else, it at least saves some wiring, an undoubted advantage, where the motor is to be installed in remote country districts.

The designer must at all times bear in mind the goal in view, or, in other words, the advantages that may be anticipated by utilising electricity in the greatest industry in the world. Judging from the experience of other industries and taking into consideration the difficulties of farm work, the benefits of electrically operating a farm may be summarised briefly as follows:—

1. Decreasing the production costs.
2. Increasing the profits.
3. Turning out more work with the same labour.
4. Simplifying operations.
5. Circumventing the adverse effects of weather.
6. Converting what would normally be losses into gains and eliminating waste.

Hence it will be gathered that the agricultural motor designer has no easy task before him.

Water and Water Power.—A paper bearing the above title was read by Mr. D. Halton Thomson, M.A., at a recent meeting of the Liverpool Engineering Society. Mr. Thomson, in the first part of his paper, reviewed the factors which influenced the flow of streams, and the way in which variation was modified by storage schemes. The relation of rainfall to run-off was shown not to be a constant, as was often assumed. The loss could not be treated as a single factor, but must be divided into its components: direct evaporation, transpiration by plant life, the amount and seasonal incidence of rainfall, and variations in natural storage, each of which should receive separate consideration. Stress was laid upon the necessity for uniformity in gauging methods. The advantages of the combination of a steam station with a hydro-electric scheme were briefly stated, the principal benefit obtained being a reduction in the necessary constructional work—reservoirs, &c. The incidence of rainfall in various parts of the country was shown by means of a map.

Electrical Depth Sounding.—The Paris correspondent of the *Morning Post*, *àpropos* of the recent acquittal of the commander of the *France* which struck an uncharted rock and sank in August last, states that Professor Langevin claims in the *Matin* to have solved the problem of avoiding such accidents as that which brought the *France* to grief. His idea is to use sound waves, which could easily be tracked by radio mechanism. These waves would be launched into the sea at the rate of 1,500 metres a second. They are transformed into sound waves, and the apparatus receives an "echo" and turns it into electric oscillation detected by radio instruments. In this way it has been possible to sound fifteen feet at a distance of several thousand yards. The whole problem consists in calculating the time elapsing between the emission of the waves and their arrival after being reflected.

THE OPERATION AND CONTROL OF STORAGE BATTERIES IN CENTRAL STATIONS.

By ABEL FASTMAN.

The storage battery has been, and is still regarded by many central station engineers as a necessary evil, inherent in direct-current supply systems; this is an entirely erroneous point of view to take of a portion of the plant, which, if properly operated and controlled, is an invaluable unit in respect of its proved assistance towards efficiency, economy, continuity of supply, and the other considerations in the direction of profitable working. It can be safely assumed that the chief reason for this prejudice lies in the excessive depreciation and consequent heavy repair charges, which occur often within a very limited period from the date of installation, and such trouble in most cases can be traced to lack of knowledge of, or carelessness in attention to, the elementary points on which satisfactory maintenance depends. Frequently, also, before actual trouble develops, the cells are allowed to drop into varying condition as regards state of charge and activity, with the result that no reliance can be placed on the capacity, which condition of affairs is invariably assumed by the central station engineer to be inseparable from battery working, and not a result of irregular treatment.

The most usual causes for unnecessary depreciation in all types of stationary batteries are irregularities in charging, chiefly of the nature of low rate inefficient and excessive charging. It is curious to reflect in this regard that in many central stations where costs are calculated to the decimals of a penny, these irregularities are persisted in not only to the detriment of the battery, but to the reduction of profits, for, as judged by the depreciation evident in many cases, the energy wasted must represent a very considerable number of units over twelve months' working. The results of over-charging include chiefly undue wear of positive plates, formation of troublesome negative sponge, rapid increase in depth of sediment, unnecessary loss of electrolyte, and possible breakdown of insulation through saturation of stands and wooden containers. These can all be avoided to a large extent by careful attention to the proper rate and duration of charge, which are comparatively simple matters in a three-wire supply station, where out-of-balance discharge is not excessive, and where the battery is charged in the usual way from the line through boosters on each side of the system, the battery being used only to assist on peak loads, or alone on all-night discharges, and charged at a convenient period during the day.

The makers usually specify a normal rate of charge, and although within well-defined limits, lower and higher rates are permissible, these may only be used to some degree at the expense of economy in charging and the possible future life of the plates, dependent on the extent of the usual variations from the normal rate. When charged at the normal rate, a battery should be regarded as fully charged when the plates are equally active in gassing, and the cells have "boiled" freely for from 15 to 30 minutes, the former period being about the correct extent of free gassing when charging is required daily, and the latter when charging is necessary only once or twice weekly or at longer intervals. It is important that as far as practicable charging should be carried out in one run, as it is false economy to utilise at various times or during light-load periods any surplus power which may be available on the busbars, by charging in instalments on two or more occasions. This arises from the fact that the effects of local action are much more pronounced when the cells are only partly charged and left in this condition for any appreciable time, while apart from this, any savings effected by utilising surplus power in this way are usually more than cancelled by the depreciation caused by the unsuitable charging rates which naturally follow on this practice.

In the case of a central station with battery arranged as described, the neutral wire is connected to the mid point of the battery, and if the balancer is able to deal with the total out of balance on the system it is advisable that this connection should not be maintained during discharge with a view to ensuring that the extent of discharge on each portion is similar. Where the balancer is not capable of coping with the total out-of-balance and the neutral connection to the battery is of necessity maintained, the battery will then share the out-of-balance with the balancer, with the result that one portion of the battery is discharged to a greater extent, thus rendering necessary variable amounts of charge. The battery when assisting the balancer in this way is more sensitive to sudden fluctuations, and although these are damped fairly quickly by the voltage drop, it is usually found that the out-of-balance discharge is considerably more than might be expected from observation of the indicating instruments, and that it increases with the extent and frequency of the fluctuations. In general, the conditions under which the balancer is not capable of dealing with the total out-of-balance preclude the possibility of charging each portion separately, or of continuing the charge on the more heavily discharged portion after the lighter discharged portion is charged, as this would further increase the out-of-balance on the system, and it therefore becomes necessary to make an adjustment in the respective rates of charge, with a view to the complete battery being brought to a fully charged condition in about the same time. To this end the differences between the outputs of each portion should be ascertained, and the rate of charge on each portion should be adjusted above and below the normal, aiming that the ampere-hours charged are approximately requisite, and when all cells have attained the stage of active gassing, the rates on both portions should be altered to the normal figure and charging completed at this rate to the gassing period mentioned, the duration of which depends on conditions of operation. It will be found that the portion which is charged at the lower rate will not be so efficient, and that the ampere-hours are not proportionate, and allowance will require to be made for this; it will also be necessary to take into consideration the rating of the booster which is charging at the high rate so that this is not loaded beyond the safe limit. The important point to be remembered in the foregoing is that the rates employed should vary as slightly above and below the normal as is consistent with arranging that both portions are charged fully over the same period. In this way, and with little extra trouble to the switchboard attendant, unduly high or low rate charging can be avoided, and more important still, overcharging of the lighter discharged portion is prevented. This method of dealing with variable discharges can be applied to a system where boosters are either of the charging type or hand reversible for discharge, and if regulating cells are included, these should be removed from circuit when fully charged in the usual way.

In some three-wire central stations the complete battery is charged by one booster, and in such cases it is highly advisable that the balancer be liberally rated and that the neutral connection to the battery, if such is included, should only be closed when the out-of-balance is negligible. The utilisation of the battery to assist the balancer or for balancing purposes alone would, in these circumstances, result in variable discharge, to compensate for which no differential treatment is possible on charge, and therefore either the lighter discharged portion is overcharged or the heavier discharged portion insufficiently charged, and as human nature is always prone to err to the greater extent, the former result is the most usual. A battery of this type should there-

fore be operated as nearly as possible under two-wire conditions.

In many older central stations the major number of the cells are charged from the line and through regulating switches to the neutral, and the remaining cells, including those used for regulating purposes, are charged by means of a motor-generator (usually referred to as a booster) connected through regulating switches to the neutral end of each portion of the battery, the circuit being continued through the cells on each side up to the contacts on which the line regulating switches are placed and completed through the neutral. This arrangement, which involves a rather expensive lay-out of copper rods, has distinct limitations for dealing with out-of-balance discharge, as although charging rates can be varied through the cells charged from the line, such is not possible in the two portions charged from the motor generator, and if these have been subjected to different discharges, it follows that irregular charging is an inevitable result. Furthermore, there are usually one or two cells between the neutral contacts to the cells charged from the line and the neutral contacts to the cells charged from the motor-generator, and these cells, which include all within the limits of travel of the line regulating switches, are also variably charged relatively to cells charged solely from the line and solely from the motor-generator. This in actuality means that the complete battery is divided into six portions for charging purposes, viz., positive and negative portions charged from the line and from the motor-generator, and the intervening cells which are charged in the first instance from the line and later by the motor-generator. In only two of these portions can the current be varied to compensate for different discharges, and if the battery has been subjected to an out-of-balance discharge, the most careful attention of the switchboard attendant will be necessary, as not only do the rates on portions charged from the line require to be varied to permit of charging over the same period, but it is also necessary to keep a careful watch on the cells charged from the motor-generator, and to operate the switches on the more lightly discharged side, as these cells come up to a fully charged condition in advance of the cells on the more heavily discharged side. The cells in which the charge current cannot be adjusted to satisfy conditions of differing discharges usually number about one-third of the entire battery, and it will therefore be readily seen that depreciation arising from out-of-balance conditions is an item of importance, and that these conditions should be avoided at all costs. The suggestion that charging on each portion should always be carried out at the normal rate during the gassing period is with a view to preventing overcharging of the portion charged at the lesser rate, as the gassing would not be so vigorous, and where the condition of the cells is judged by observation, as should always be the case, the attendant might be misled. The fully charged appearance of the cells, when charging is being carried out at the normal rate, should be familiar to the attendant, and every endeavour made that both portions are in an equable condition as regards state of charge, and thus overcharging during direct charging will be largely prevented.

Overcharging may, however, occur in a further way, and to a more serious extent, in the case of a central station where the battery "floats" on the line for buffer purposes during times of light load. Whether in a partly or fully charged condition, if the line voltage exceeds the battery voltage to any extent, the cells are subjected to a constant charge at very low rates, which has a very wearing effect on the positive plates, this being more pronounced when these are fully charged. Apart from this, it is a distinct waste of energy, as even when the battery is not fully charged the units charged in this way are not recoverable on discharge, and in fact the plates are simply corroded. The simple precaution of retaining sufficient cells between the outers, so that the battery pressure exceeds the line pressure, and that cells are discharged slightly and not charged, would completely prevent any trouble from this cause. It should, however, be remembered that floating discharge, unlike low rate floating charge, is effective, and is an actual discharge, thereby reducing the available output. If an out-of-balance exists under these conditions, the more heavily loaded side will discharge to a greater extent, but such discharge should not be reduced by altering the number of cells on the lightly loaded side, and therefore between the outers, to the extent which would permit of floating charge as a result of the total battery pressure being less than line pressure. The voltage across the total number of cells in circuit should slightly exceed the line voltage under all conditions of floating, as the difference in discharge which may arise from out-of-balance is the lesser of two evils, and can in most cases be adjusted on a following charge.

When the number of cells does not permit of this precaution, the booster, if of the hand-reversible type and capable of fine voltage adjustment, should be operated, or alternatively more cells should be added; of which the latter proposal is preferable.

The instruments installed in the battery circuit should include, in addition to the usual indicating ammeters and voltmeters, a recording ammeter and voltmeter, and charge and discharge integrating meters preferably of the ampere-hour type, and all should by periodical checks be maintained in an accurate condition and used in conjunction with careful observation during the latter stages of charging. The ampere-hour efficiency of a healthy battery may be regarded as a constant, but the watt-hour efficiency is affected by so many factors that it can only be expressed under very different limitations, so that satisfactory control is practically impossible in this way. If suitable rates are employed for charging, and floating charging and overcharging is avoided, the ampere-hour efficiency should approximate between 88 per cent. and 90 per cent., according to the extent, frequency, and rates of discharge. A higher efficiency cannot be obtained, and a lower efficiency indicates overcharging, provided the instruments are accurate. Integrating meters of the ampere-hour type arranged to read in units should not be used.

The foregoing remarks may be summarised in general directions to the effect that the out-of-balance should be minimised as far as possible, that charging should be at about the normal rate having regard to different discharges from each portion, that extent of charging should be limited as mentioned, and that floating charge should be carefully avoided, while in addition observation of appearance of cells should play an important part during charging and observation of instruments at all other times, together with a careful regard to all points on the working instruction card.

The conditions under which a battery is operated in conjunction with an automatic reversible booster differ to a considerable extent from those applying to usual three-wire systems, and the correct procedure in such cases depends on the nature of the load and type of booster. It may, however, be said that where the booster is externally controlled, and the frequency and extent of the load fluctuations somewhat pronounced, it is advisable to aim at full equalisation, when no doubt the "dips" will permit of charging at proper rates. If, however, the peaks and dips are not very marked or are out of proportion during peak loads to the load curve during between-peak loads, it will be generally found advisable to set the average line current lower during peak discharges, and higher during between-peak loads, aiming at about 90 per cent. ampere-hour efficiency over each day's working, in which way undue low-rate charging and overcharging will be avoided. The battery under these conditions should never be overcharged by a prolonged net charge or overdischarged during a period of net discharge.

The assumption that the operation is at fault is in most cases found to be correct, where central-station batteries fail within a limited period; but if proper care and treatment is given on the lines suggested, and reliable judgment cultivated by careful attention, depreciation can to a considerable extent be avoided.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A New "Tok" Switch.

A number of improvements have been incorporated in the design of the new switch, illustrated in fig. 1, which is made by Tok Switches, Ltd., Granville House, Arundel Street, W.C.2.

The cover is made of a black heat-resisting, non-hygroscopic, insulating material, which is highly polished. The indicator, showing the position of the switch, consists of a disk on which the markings are boldly embossed in white, on a bevelled edge, so that when the switch is mounted vertically on a cooker the

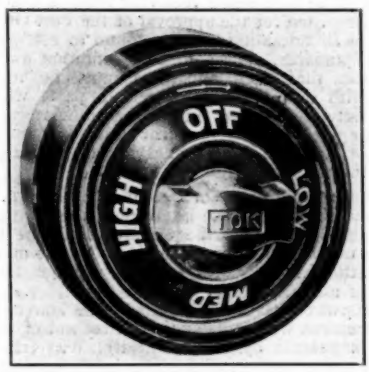


Fig. 1.—A New "Tok" Switch.

position of the switch can be easily seen The underside of the indicator is fashioned in such a manner as to make it impossible to put the indicator on the wrong way in relation to the switch position. The key is provided with a locking device. This is a rack in the centre of the indicator, over which works a metal projection moulded into the inside end of the key. By this means the key is only allowed to be turned in a clockwise direction. To unscrew the key it has to be pulled forward clear of the rack. The key is made of material similar to that of the fireproof cover, and will not soften or turn on the spindle when subjected to high temperatures.

The switch is made with a variety of interior arrangements and for a wide range of currents.

The "Unit-Ad-Shade."

As briefly mentioned in our last issue, an ingenious advertising device, the invention of Mr. C. M. Bennett, has been developed by Messrs. Lamlok, Ltd., and is being put on the market by the Unit-Ad-Shade Co., of 133, High Holborn, London, W.1, which has been formed to handle the business commercially. As shown in the accompanying illustrations, it consists of a spun aluminium shade

Fig. 2.—The "Unit-Ad-Shade."

with a turned-up rim (fig. 2), on which are clipped a number of small brass frames. Into the frames (fig. 4) thin stencil letters can be slipped, together with glass plates of any desired colour, the latter being behind the stencils. Thus the letters are illuminated by the lamp without interfering with its normal functions. The letters are interchangeable, and the wording of the sign can be changed as often as desired, the operation taking only a few minutes at most. The aluminium shades are made in various patterns to suit usual requirements, and can have any desired finish; or the ordinary conical opal shade can be fitted with a narrow aluminium ring clipped on its rim (fig. 3). A special carrier is made for use with Holophane shades. In the case of pendants, the weight of the letters on one side is counterbalanced by a suitable weight clipped on the opposite side, unless

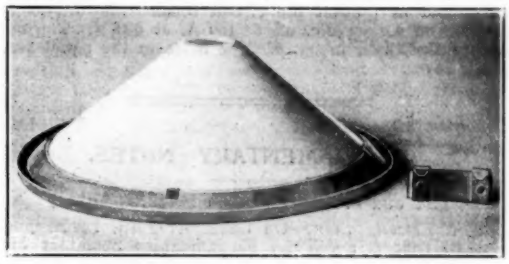


Fig. 3.—Opal Shade with Ring; and Counterpoise.

the lettering is so arranged as to remain in balance without this aid. The frames are provided with wings which effectually prevent leakage of light between them, which would

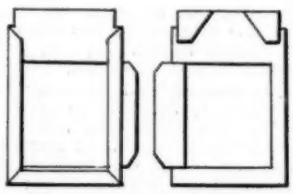


Fig. 4.—Frames to Carry Letters; Front and Back Views.

detract from the effect. The simplicity of the device and the ease with which its message can be varied should ensure its wide adoption in show-windows, shops, and innumerable other places where notices are exhibited.

The "Losles" Automatic Temperature Controller.

An improved form of the "Losles" automatic temperature control system, introduced by Mr. G. Wilkinson, of Harro-

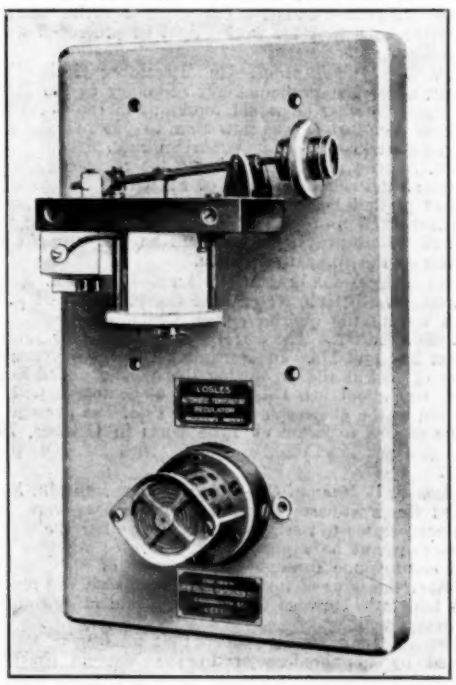


Fig. 5.—The "Losles" Temperature Controller.

gate, has been designed by the Leeds Electrical Construction Co., Ltd., Charmouth Street, Leeds. The system, as applied to the control of electric radiators, ovens, &c., consists

of a thermostat and a circuit breaker, with a shunt in which the thermostat is connected. The thermostat is fitted with an expanding diaphragm, and when the latter closes the thermostat contacts the shunt circuit is completed and the circuit breaker opened, cutting off the supply to the radiator or oven. The actual load handled by the thermostat does not exceed 12 W. The opening of the circuit breaker is made in two mercury cups. When the thermostat contacts open owing to reduced temperature the shunt circuit is broken and the circuit breaker closed. This action can be arranged to operate within 3 deg. F. (plus or minus) of any desired temperature. The device leads to a considerable saving of electricity, and at present the circuit breaker is designed for operation on a.c. or d.c. up to 100 A. at 600 V. The equipment is illustrated in fig. 5. The holes in the panel are for fixing a cover.

PARLIAMENTARY NOTES.

[By our Special Parliamentary Reporter.]

G.E.R. Electrification.—On December 12th, Lieut.-Col. Sir Raymond Greene asked the Parliamentary Secretary to the Minister of Transport, whether he was aware of the inadequate facilities for travelling from Hackney and Stoke Newington to other parts of London; whether any scheme had been put forward by the Great Eastern Railway Co. and the North London Railway Co. for the electrification of their lines; and, if not, whether he could urge upon those companies the need for some action to secure further facilities to the travelling public.

Col. Ashley replied that no specific schemes for the electrification of the line referred to had been put forward by either of the companies named. He had, however, communicated the question to both companies.

Stretford Light Railway.—On December 12th Mr. Lowth asked the Parliamentary Secretary to the Ministry of Transport, whether he was aware that although the Stretford Light Railways Order and the West Manchester Light Railways (New Lines, &c.) Order were made in 1906, no steps had yet been taken to put the work in hand; that the working population of Trafford Park having considerably increased the road and railway were more urgently needed than ever; and whether, in view of the fact that it was 16 years since the Orders were made, he would take whatever action was possible to get the schemes commenced, thus giving an opportunity of work to many unemployed men.

Col. Ashley said he was informed that the Stretford Urban District Council, which was empowered by these Orders to construct certain light railways and a road between Stretford and Trafford Park, was desirous of proceeding with the work, and was in negotiation with a view to the removal of certain difficulties which had arisen in connection with the crossing of the Bridgwater Canal. The Council stated that it had reason to hope that the work might be proceeded with at an early date.

G.N.R. Electrification.—On December 12th, Viscount Ednam asked the Parliamentary Secretary to the Ministry of Transport whether he would represent to the Great Northern Railway Co. that it was now time to put in hand a scheme for the electrification of its suburban lines.

Col. Ashley replied that no scheme regarding the electrification of the suburban lines of the Great Northern Railway was at present before him. The question of the preparation and introduction of such a scheme was one for the consideration of the railway company, and he had brought the suggestion to the company's notice.

Coal Prices.—On December 12th, Lieut.-Col. Lane Fox, Secretary for Mines, stated that the price of coal at the pithead during the quarter ended September, 1922, averaged 18s. 2¾d. per ton. The corresponding figure for 1914 was between 10s. and 11s. In Northumberland the average selling price of coal at the pit during the quarter ended September, 1922, was about 18s. 11d. per ton, as compared with 9s. 5½d. per ton in the quarter ended June, 1914. The average declared value of coal exported at Tyne ports in October, 1922, was 20s. 10d. per ton f.o.b., comparing with 11s. 10d. per ton in 1914.

Licences to Marconi Co.—On December 12th Mr. Middleton asked the Postmaster-General what licences were issued by his predecessor to the Marconi Co.; whether the text of such licences might be supplied to the House; whether the State had lost revenue through the operation of such licences; and whether the issue of further licences to send and receive wireless telegrams between Great Britain and other countries was contemplated.

Mr. N. Chamberlain replied that no formal licences were issued by his predecessor to the Marconi Co., but provisional permission was given for the erection of a wireless station at Ongar for the purpose of carrying on a wireless service with Switzerland, and also for the purpose of continuing wireless services with Spain and France, which had previously been commenced under temporary permits. The question of the conditions under which permanent licences should be granted was still the subject of negotiation. The terms of any agreement that might be arrived at on the subject would be laid before Parliament. Although the Marconi services had withdrawn a certain amount of traffic from the Government cables the effect on the revenue was not appreciable.

Wireless Apparatus.—On December 12th, Major McKenzie Wood asked the Postmaster-General what arrangements, if any, had been made with the Broadcasting Co. or the British Radio Apparatus Manufacturers' Association for notifying the electrical trades as to the admissibility of imported parts in wireless apparatus approved for Post Office licence; whether he was aware that leading British import houses who had hitherto sold parts to wireless manufacturers were finding the greatest difficulty in securing the information necessary to guide them in considering forward contracts; and whether he would consider the issue of a detailed statement on the subject.

Mr. N. Chamberlain said that the receiving apparatus which might be used under receiving licences would be limited to types submitted for the approval of the Post Office by members of the Broadcasting Co. and found to conform to certain technical standards. It would be a condition during a period of two years that such apparatus must be made in this country with the exception of certain parts which, for the present, were confined to batteries, accumulators, and outside aerial equipment. These conditions were announced by his predecessor, but he would endeavour to secure publicity for them in the technical Press.

The Marconi Claims.—On December 13th, Mr. Middleton asked the Chancellor of the Exchequer whether any claims by the Marconi Co. against the Government were outstanding; if so, the number and the respective amounts of such claims; why a settlement was delayed; and whether there was any prospect of an early settlement.

Mr. Baldwin replied that claims by the Marconi Co. against the Government were outstanding in respect of the use of the company's patents by the Admiralty, War Office, and Air Ministry, and in respect of the company's services to the Post Office during the war, and also in respect of the future payments, if any, to be made for the use of the company's patents by the Post Office in connection with the Imperial wireless chain. He did not think it advisable to refer to the amounts involved in the claims under discussion. In reply to the third part of the question, the late Government decided that there must be a comprehensive settlement of all these claims rather than individual settlements, and this had necessarily caused some delay. He could only say, in reply to the fourth part of the question, that negotiations were being pursued.

Tube Extension Contracts.—On December 14th, Captain Brass asked the Chancellor of the Exchequer whether he was aware that the Foundation Co., Ltd., to which a contract had been given for a portion of the Hampstead tube extension under the Trade Facilities Act, was an offshoot of the Foundation Co., of New York; whether the contract for this work was offered in open competition in this country; and, if not, whether a list of those invited to tender could be given.

Mr. Baldwin said that he understood that thirteen firms were asked to tender, and that the tender of the Foundation Co. was not only the lowest, but favourable as regarded dates of delivery. The company was a British firm, separate from the New York company, and undertook to fulfil all the usual stipulations with regard to the use of British materials.

Midland Railway Electrification.—On December 14th Captain Martin asked the Parliamentary Secretary to the Ministry of Transport whether he was aware that a clause was inserted in the Midland Railway (London, Tilbury, and Southend Railway Co. Purchase) Bill in July, 1912, to the effect that the company should forthwith prepare a scheme for working the traffic by electric power on the route between Fenchurch Street station and Southend-on-Sea; and what extension of time had been granted to this company to carry out the obligation imposed on it by Act of Parliament.

Col. Ashley replied that the Act provided that the Midland Railway Co. should apply to Parliament for any powers necessary to carry out an electrification scheme not later than the session of 1914, and the period so limited was extended to the session of 1916 and later to the session of 1917. There had been no further extensions.

Sale of Queensferry Factory.—On December 15th Sir Rowland Blades asked the Chancellor of the Exchequer whether he was aware that the War Office had arranged to dispose of the Queensferry electricity plant, building, and land to the City of Chester for £54,000, and that another offer had been made to purchase the factory, and that the present sale was being entered into without any opportunity being given to others to tender for the factory; and whether he was prepared to sanction the sale of Government property for about one-third of its value without giving other willing buyers the opportunity of making higher bids for the property.

Mr. Baldwin replied that for over a year the Queensferry factory had been advertised for sale in one lot, but no reasonable offer had been received, consequently the factory was being disposed of piecemeal to the best advantage; and the power-house, plant, and site had been sold by the Disposal Board to the Chester Corporation for £54,000, subject to the approval of the Electricity Commissioners. The price of £54,000 was the best obtainable. The Corporation was at

present obtaining electricity from this source under a three years' agreement, which had not yet expired. The Disposal Board was willing to consider any reasonable offer to purchase the remainder of the factory.

Royal Assent.—On December 15th the Royal Assent was given, by Commission, to the Trade Facilities and Loans Guarantee Act, 1922, and to the Glasgow (Tramways, &c.) Order of Confirmation Act, 1922.

Parliament rose on Friday, December 15th, until Tuesday, February 13th, 1923.

LEGAL.

Magnetos Alleged Not to Order.

In the Mayor's and City of London Court, on December 12th, before Mr. Registrar Dell, John Palmer, Jun., & Co., Dauntsey House, Frederick's Place, sued the County of London Engineering Works, Ltd., 27, Stockwell Road, for £65 12s. 10d., return of money paid, or, alternatively, damages for breach of contract. Mr. Matthews, in the employment of the plaintiffs, said his firm bought from the defendants magnetos represented to be in perfect order. They paid 50s. 6d. each. Eighteen magnetos were packed by the defendants and shipped to South Africa, where they had been rejected by their (plaintiffs') customer in South Africa as not being according to order. Notice had been given to the defendants that the magnetos had been returned, and that they were lying open to their inspection. Within the last three days an inspection had been made by the defendants, plaintiffs also being represented. The total amount due in respect of the shipping was £65 12s. 10d., representing £51 12s. the price of magnetos, the balance being in respect of freight and charges. Mr. Kirby, motor engineer, said that he had examined the magnetos in question and found they were second-hand machines. Old parts had been put together, and the re-assembling had been done badly. He would certainly reject such goods upon an order for new magnetos, in going order, surplus Government stock. He would say that the magnetos supplied were certainly not in compliance with such an order, and a customer would be entitled to reject. There was no appearance on behalf of the defendants, and judgment was given for the plaintiffs for the amount claimed. Later counsel and solicitor appeared in court to defend the case on behalf of the defendants, and an application made for the case to be re-heard. Eventually it was ascertained that the witnesses for the plaintiffs had been sent away, and the case could not be re-heard that day; it was therefore adjourned.

Ferguson *v.* Manham.

Judge Cluer gave his decision as to damages recoverable, owing to employés being thrown out of work through the faulty installation of a machine, in the Shoreditch County Court on December 12th. The plaintiffs were Messrs. C. J. Ferguson & Sons, of 54, Chiswell Street, E.C., electrical engineers, and they sued Messrs. Manham & Co., of 28, Sun Street, E.C., manufacturers, to recover £2 5s., being the fitter's time incurred in disconnecting a defective 3-h.p. motor and fixing in its place another 3-h.p. motor, connecting it, and leaving it running.

Mr. A. E. Robinson appeared for the plaintiffs.

It appeared that the plaintiffs were called in to see defendants' electric motor, and found the armature burned out, whereupon they advised defendants that it was useless, and they had better have a new one, to which they agreed. They were charged £28, and the plaintiffs had the old one as well.

The defendants said it only went for two hours, when it stopped, and the whole of their 15 hands were idle for four hours while the plaintiffs put it right. The plaintiffs' charge was for putting their own defective work right, it was declared, but plaintiffs' manager said it was for the time employed in fixing the motor. He did not consider plaintiffs liable for the stoppage of the works.

Judge Cluer: What he says is, that if he supplies you with an engine without a piston rod, he is not to pay you for the time wasted while you send for the piston rod.

The defendant was cross-examined, and agreed that the motor might have failed through want of lubrication, but that had to do with the fixer, and not with him.

Judge Cluer said the plaintiffs were clearly liable if the machine was fixed without any lubricant, but the girls' time for the loss of business was, he was afraid, too remote for damages. If work was run so close up, he did not think the fixer responsible. He gave judgment for the plaintiffs on the claim for 32s. 6d., and for the defendant on his counterclaim for 5s.

Workmen's Compensation Case.

A case under the Workmen's Compensation Act was heard in the Norwich County Court last week, when Horace J. D. Langham, apprentice fitter, of Norwich, claimed compensation for an accident against Messrs. Laurence, Scott, electrical engineers, of the Gothic Works, Norwich.

Counsel stated that on April 15th, last year, Langham was drilling holes in a steel casting, when the drill broke and part of it lodged itself in his right eye, which had to be removed. There was no dispute as to liability. There was no question of liability until after February 28th of this year, because the firm took the man back and treated him very generously, paying him full wages until the end of his apprenticeship on February 28th, when, as a rule in such cases, he finished his service, and had to find employment elsewhere to broaden his experience. From that date until June 19th, when he got a position as grocer's assistant at 25s. a week, the applicant was unemployed. The man was unable to find work. His wages before the accident were 35s. a week. He would, in the ordinary way, have been earning 45s. 6d. per week, and counsel ask for half the difference between 45s. 6d. and 25s., the wage he was now earning.

For the respondents, Mr. Edmund Reeve said that the rule of Messrs. Laurence, Scott, Ltd., with regard to apprentices, was that, for their own benefit, they should get experience in a wider field following the completion of their apprenticeship. Applicant was still eligible for some engineering work if he could get it. It might not be wise for him to do drilling work, but there was a great deal of other work that a one-eyed man might do.

Mr. James William Bransby, works manager to the respondent firm, said that the applicant was handicapped by having to wear glasses, but it was quite possible for a one-eyed man to do engineering work. As the applicant had stated, he had left the firm simply because of the rule that apprentices sought work elsewhere after completing their apprenticeship. In cross-examination, he said that applicant could not get work as a fitter to-day on account of the trade; there were thousands of men with full sight out of work. As improver, applicant would have been paid 43s. 6d. per week.

For the respondents, Mr. Reeve submitted that if the engineering market were normal, this man could do engineering work. He certainly ought to be about a 35s. a week man if the Trade Union would allow him to work—25s. was not the measure of the man's value. His Honour would be justified in taking something between 35s. and 43s. 6d. a week.

His Honour, in giving judgment, said it was not fair that the applicant's deterioration had gone down to 25s. a week; his earning, he thought, might be calculated to be reduced from 43s. 6d. to 30s. That meant a loss of 13s. 6d. a week. That amount would be allowed during the time applicant had been out of work, and afterwards it would be 10s. a week.

CORRESPONDENCE.

Letters received by us **after 5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Electrical Trading Relations.

With reference to the remarks in your issue of December 1st by Mr. Barfield, regarding the cost of electricity as compared with gas for engineering production, I should like to take this opportunity of endorsing what he says. As a matter of fact, he did not carry his point as far as he might have done, perhaps from modesty! Not only has the running cost been proved cheaper, but—what is of even more importance—the finished product is better. There is no scrap, and further, unskilled labour can obtain better results every time in the Wild-Barfield Furnace than highly-skilled men with gas muffles can ever obtain consistently.

At several engineering works where these furnaces are installed, I have been informed that even if the running costs were higher than those of gas, the furnaces would still be cheaper in view of the avoidance of scrap, due to certainty of results.

F. W. Skidmore.

Coventry, *December 5th*, 1922.

Technical Engineers.

I regret having to trespass on your valuable space, but feel that it is necessary in view of the letter appearing in your issue of December 1st, signed by "One of Them."

It is, of course, generally recognised that the S.T.E. does not cater, as a protective organisation, for the technical engineers, and, from its constitution, cannot do so. The only two organisations, so far as I am aware, which cater for the economic and educational needs of such supervisory workers in the electrical industry as managers, foremen, supervisors, technical representatives, &c., are the E.P.E.A. and the National Association of Supervising Electricians. It is understood that the E.P.E.A. deals mainly with the power-station people and the N.A.S.E. with the remainder.

Both organisations demand certain qualifications for admittance to membership, and as a member of the N.A.S.E., I know this organisation has done much for its members and has a national agreement with the Employers' Association covering its members in the contracting trade, and has under consideration the question of approaching the Engineering

Employers' Federation on behalf of its members in the engineering industry.

In addition to the economic policy of the N.A.S.E., your readers will have noted, from the reports appearing in the ELECTRICAL REVIEW from time to time, the excellent educational work which the Association is doing—a fact, I am informed, which is freely commented upon. In addition, there are monetary benefits.

As the N.A.S.E. caters for the technical staffs of electrical manufacturing firms, if the staffs desire to join a live organisation, those concerned should apply to the general secretary, N.A.S.E., 82, Victoria Street, London, S.W.1, for particulars.

Organisation.

London, *December 5th*, 1922.

The Society of Technical Engineers.

Few would begrudge Mr. Norman Wyld the pardonable chuckle with which he delivered his *riposte* to your correspondent, "One of Them," who certainly timed his thrust at the S.T.E. rather unfortunately in one respect. All the same—unless it is attributable to coincidence—there is evidence that the point of the latter's rapier pricked some sensitive spot, to judge by the considerable effusion of printer's ink which has followed. This sudden leap into the limelight is a distinctly new departure for the Society, which, ever since the flourish that accompanied the declaration of its somewhat anæmic "policy," has consistently shunned publicity.

It is scarcely possible from the information given in the Press to gauge the precise extent to which the S.T.E. has succeeded in organising the class of technical engineers for which it ostensibly caters. There is a good deal of talk about what should be done and what should be aimed at, but little indication of solid accomplishment. True, the establishment of an unemployment insurance scheme is trumpeted with considerable emphasis. Now, an efficient scheme of this sort is an excellent thing, without doubt, but in this case there is some foundation for the suspicion that the initiative lay with a section of the members themselves, and not with the Society, which only took the matter up after it had been proved a success.

There is a vague claim put forward that the S.T.E. has succeeded in securing for its members advantages with regard to their conditions and terms of employment, but the general impression I have gained is that of "much cry and little wool."

To my mind the real test of the Society's success is the percentage of potential members it has managed to attract to its standard. Rumour has it that roughly about 2,000 out of a possible 20,000 or so have been so impressed with the advantages offered as to become enrolled in the membership.

I am not a member of the Society; I have neither direct interest in nor animus against it; but I consider the numbers and importance of the technical engineers in manufacturing concerns to be so great that their efficient organisation is a matter of urgent moment to themselves, to the engineering profession, and to engineers of similar standing in other fields. If 2,000 out of a potential 20,000 is the criterion of the Society's success in organisation, then I consider it has lamentably failed.

It would be interesting to learn the reasons for this failure to attract members. Is it the policy of the Society which is at fault, or are its methods of propaganda inadequate? Are its declared objects of too restricted and conservative a character to serve as a means of creating enthusiasm for its cause, or is there a suspicion amongst technical men in engineering manufacturing works that the S.T.E., under its present auspices, has, owing to timidity or from preference, too much regard for the interests of employers for it to function advantageously for the benefit of those of an employed status?

I make these inquiries with the hope of eliciting some information, as I am convinced there is a great field for a live and go-ahead organisation of the technical staffs for which the S.T.E. claims to act.

One is led to question whether all is well with the S.T.E. when one considers the success of the E.P.E.A. The latter, with a much more restricted field and a much smaller potential membership, has succeeded, by dint of a well-considered policy and utilisation of the unbounded enthusiasm of its honorary officials, in securing substantial benefits and advantages for its members. In addition, it has gained recognition from all authorities connected with the electricity supply industry as the representative organisation for technical engineers engaged in that branch of engineering.

Those who control the activities of the S.T.E. would, in my opinion, do well to consider seriously the position of their Society, lest its apparent somnolence and comparative failure eventually lead to its membership falling away in disgust and disappointment, and turning towards a live organisation, which can at least lay claim to having proved its efficiency. Speaking personally, I venture to hazard the opinion that the E.P.E.A., while earnestly desirous of seeing the S.T.E. wake up and do something to attract the 18,000 engineers still outside its ranks, would be prepared, if called upon, to undertake the task itself.

I shall doubtless be accused of indulging in propaganda for the E.P.E.A., and of adopting to this end the mean expedient of attacking a kindred association. As a matter of fact, I am quite indifferent as to which particular organisation does the work. The main point is that one or other should take the job vigorously in hand.

There may be special difficulties in the path of the S.T.E. of which I have no knowledge. Difficulties, however, should act as incentives to increased efforts to overcome them. Is the S.T.E. going "all out" to tackle these difficulties, and are its members satisfied of this? It would be interesting to know.

Salvo jure.

December 17th, 1922.

The Improvement of Power Factor.

When recently I made a few remarks at the I.E.E. I fully hoped and expected some instructive criticism, as I felt certain that my good friend Mr. E. W. Dorey must be in the room. However, my disappointment and misgivings at the time now appear to have been without foundation.

The amount of energy stored in a condenser in watt-seconds is, I believe, dependent upon the capacity and the square of the voltage applied, and may be expressed by the equation $W = \frac{1}{2} CV^2$. Obviously, therefore, the higher the voltage the smaller the capacity C required for any specified kVA correction or £ s. d. equivalent.

A year or two ago Mr. Dorey quoted and published the fact that the capacity required to produce a certain leading current could be expressed as C in microfarads = leading load in kVA $\times 10^9/2\pi n \times V^2$, n being the frequency and V the voltage across the condenser. Now, however, our datum lines or standpoints should be specified. Mr. Dorey is avowedly a salesman of static condensers and wishes to grind his axe accordingly. Both your correspondents appear to think that I wished to depreciate static condensers.

For years I have been convinced that sooner or later supply authorities would seriously have to tackle their own power factor afflictions.

Being personally connected with the supply industry, your correspondents should, I think, rather regard me as a possible small influence in the direction of a buyer of condensers. Knowing me personally, Mr. Dorey is aware that I am not in a position to take up his challenge. As we are both desirous of working in the same direction, but from absolutely different platforms, I contend that, with a few exceptions, supply authorities' personnel are not aware what poor power factor is costing them. All who are really interested in cheap electricity must get down to "bed rock."

In conclusion I would ask all correspondents and contributors to your columns to satisfy themselves as to what I actually did say, and to take no notice of what I am reported as having said I am out for information, and not for destructive criticism.

W. E. Rogers, A.M.I.E.E.

London, *December 17th*, 1922.

REVIEWS.

The Practical Applications of X-rays. By G. W. C. KAYE, O.B.E., M.A., D.Sc., A.R.C.Sc., F.Inst.P. Pp. viii+135 figs. 96. London: Chapman & Hall, Ltd. Price 10s. 6d. net.

Besides dealing with the actual applications of X-rays, this book contains a readable account of the physics of X-rays, and can be recommended, both to the general reader who wishes to keep in contact with X-ray progress and to many actual radiographers whose knowledge of the physics of the phenomena they utilise is often slight.

The chapter on the X-ray bulb is illustrated by the usual types of tubes commonly used. Of more interest, since the weak link of X-ray installations is doubtless the tube itself, are the illustrations of the metallic Shearer tube, and as a minor criticism it is regretted the author has not given a reference to the original source. The Coolidge tube is dealt with at some length, but the German Lilienfeld tube, which is becoming an increasing favourite abroad, is rather scantily dealt with.

The high-potential generator is dealt with on the usual lines, and is well illustrated.

In the chapter on measurement of X-rays the essentials of the Seemann spectrometer are illustrated, and to the electrical engineer the alternative use of this instrument as an accurate high-pressure voltmeter is becoming of importance. It is to be regretted that the author has not pointed out the desirability of more accurate physical measurements in place of the empirical barium-plantino-cyanide pastille which, whilst extensively used in England, is practically useless with the methods of deep therapy used abroad, for which the Furstenau Intensimeter is largely employed, and which is very scantily dealt with by the author.

The chapter on medical applications is very brief and open to comment. It is doubtful whether, as stated on page 76, that we are yet able to say deep-seated organs are "successfully" treated by X-rays, even with the German technique the author describes. The author omits to point out that the

results depend both upon the histological type of growth and its situation. In commenting upon the difficulties of measuring the deep dosage of X-rays (for which the pastille method is useless) the author could very well have introduced a method using scales which are superimposed on each other in accordance with the different ports of entry. This method, first shown to the reviewer by Prof. Holthusen, of Hamburg, early this year, has since been described in the English medical papers. It is to physicists of the eminence of Dr. Kaye that the purely medical radiologists must look for an evolution of more accurate physical methods of measurement.

In the industrial applications of X-rays the author is on more familiar ground. It is of interest to note the spectrometer used at the N.P.L. is actually a modification of the Bragg instrument. The applications of such a spectroscope to analyse mixtures of salts which present difficulties to ordinary chemical methods, and the author's statement that such a method is more simple and certain than the optical spectroscope indicates a very important future use of X-rays, and one likely to be of much more importance than its temporary use to examine shell fuses, hand grenades, revolvers, &c., which the author extensively illustrates. Perhaps the greatest use of X-rays in industry will be to examine aeroplane castings and parts for flaws and bad workmanship, which the author deals with at length, but it would have been well if the author had laid stress on the dangers of industrial X-ray work to the operatives, and it is doubtful whether the advantages offered by X-rays to examine the cores of golf balls, as the author illustrates, is not overbalanced to the great risk to the operatives owing to their own possible ignorance and carelessness, or where an employer, on grounds of economy, neglects proper safeguards. Should, however, this type of application become more general, doubtless stringent Home Office legislation will be introduced.

A very interesting portion of this book is the section describing the use of X-rays to detect spurious old masters, which is very well illustrated. As, however, the method largely depends on the use of inorganic paints by the old masters and the use of the copyists of organic paints, which give no shadow with X-rays, it would seem the method is likely to be useless if the copyists retaliate by using old canvases and inorganic paints.

The final section on the future development of X-rays is very suggestive, and the author points out that progress depends on the more intimate relations between radiologists and electrical engineers, and one could go farther and say that the future of medical X-rays depends on the medical radiologist being a trained physicist and engineer as well as a medical man.

Whilst the book has been somewhat severely criticised in minor points, which doubtless a physicist of Dr. Kaye's standing would prefer to a merely laudatory review, the whole book can be warmly recommended to everybody interested in X-ray work. The method of production and the many excellent half-tone plates leave little to be desired.—B.J.L.

The Lead Storage Battery. By H. G. Brown, A.M.I.E.E. Pp. 162; figs. 60. London: The Locomotive Publishing Co. Price 5s. net.

This volume is by no means the first attempt to provide the station engineer and the user of the lead storage battery with the essentials of this subject, which depends so largely for its successful application on a fairly complete understanding of its underlying principles, and on a common sense knowledge of its practical operation.

The author has approached his subject with a mind singularly free from prejudice, and has credited his readers with some knowledge and reason.

The book has ten chapters, only one of which is devoted to theory. The generally accepted theory of the chemical changes in an accumulator is the only one dealt with, and in making this limitation the author shows wisdom, as it is possible to explain by means of this theory alone most of the results obtained in practice. A part of the appendix dealing with the ionic theory might have been omitted without detracting from the value of the work.

The second chapter is concerned with the electrical characteristics of the lead battery, and the graphs are of much practical utility. The graph showing the relationship of "capacity" to "duration of discharge" is closely in accord with that which is recognised by the industry as approximately applicable to all types of lead accumulator, and this, together with the corresponding graph of "rate of discharge" against "duration of discharge," should prove extremely useful.

Further chapters deal with the construction of cells, erection of stationary batteries, boosters and switches used in battery installations, battery testing, and battery economics. This last section is very clearly explained, and to the reader who has not devoted much thought to the subject may come somewhat as a revelation.

A series of useful diagrams on pp. 74-80 gives details of the connections in use for country-house lighting plants and central stations. Train lighting batteries, vehicle batteries and car starting batteries are discussed in a separate chapter, which also furnishes some information regarding the very large cells used for the underwater propulsion of submarines.

In the appendix suggestions are made for the testing of the water and acid used in connection with lead batteries. The standards for the calorimetric estimation of iron and ammonia shown on page 154 are a striking and bold innovation. Disks printed in colour on this page indicate depths of colour for passing and for rejecting specimens of acid proposed for use in batteries. The colour relating to the permissible proportion of iron appears to allow for a degree of impurity needlessly high. It is possible to obtain very easily accumulator acid which is almost entirely free from iron. As a colour standard for rejection, it would have been advisable, we believe, to employ one shade of colour as a passing standard and to stipulate that if a sample of the acid diluted by, say, twice its volume of distilled water, gave a colour deeper in tint than that used as a standard for passing, then the acid would be unsuitable for use.

From the colour printing standpoint the opinion of the accumulator chemist will undoubtedly be that the ammonia tests are well illustrated, while there is some doubt about the iron test colours.

As a whole the book is excellent of its kind and complete within the limits of its size. It could confidently be placed in the hands of any user of batteries who desires to give them the attention they really require. There will, however, be some hesitation on the part of a great many battery makers in recommending the book, for the reason that the name of one of the best-known accumulator manufacturing companies is prominently identified with the illustrations.

The Wireless Telephone: What it is, and how it works. By Philip R. Coursey, B.Sc., F.Inst.P., A.M.I.E.E. Pp. 112; figs 49. London: The Wireless Press, Ltd. Price 2s. 6d. net.

The author describes simply the essential principles of wireless telephony, and explains how the apparatus required is built up. The book is profusely illustrated with photographs and sketches showing how the apparatus may be connected up. These sketches are a distinctive feature of the book, as they are generally employed in place of the usual circuit diagrams. As "lay out" sketches they are excellent, but the inclusion of more circuit diagrams would be helpful to the beginner, for whom the book is primarily intended, as it is not always easy to follow the circuits in the sketches. In the last chapter is outlined clearly a method of building up a simple receiver for broadcast messages.

The book should be very useful to all those who are now becoming interested in the working of wireless telephony.

The Mechanical Handling and Storing of Material. By G. F. Zimmer, A.M.Inst.C.E. Pp. xx+804; illustrated. London: Crosby, Lockwood & Son. Price £3 3s. net.

First published in 1905, the present volume is the third edition of this extremely interesting and popular work, dealing with "labour-aiding appliances and time-saving appliances," as the author terms them, on the suggestion of Sir John Purser Griffith, past president of the Institution of Civil Engineers, who has written a "Foreword" for the present edition. As the title indicates, the book consists of descriptions, illustrated with photographs and drawings, of almost every conceivable sort of apparatus for handling material, and is divided into seven main sections. These are: (1) The Continuous Handling of Material by Means of Mechanical Conveyors; (2) The Continuous Handling of Material by Means of Pneumatic and Hydraulic Means; (3) The Intermittent Handling of Material; (4) Unloading and Loading Appliances; (5) Unloading of Railway Wagons; (6) Miscellaneous Installations; and (7) The Automatic Weighing of Material. It is a strongly-bound volume of some 800 pages, divided into 44 chapters and a very complete index. It is a book which should be on the shelves of every works manager and engineer.

The Electrical Handling of Materials. By H. H. Broughton, M.I.Mech.E., M.I.E.E. Pp. xvi+336; figs. 299. London: Benn Brothers, Ltd. Price 50s. net.

This book is Vol. 3 of a set of books dealing with the electrical handling of materials, and deals with "Electric cranes." Vol. 1 deals with electrical equipment, and Vol. 2 deals with structural steelwork and mechanical equipment. The present work consists of a well-bound volume of 336 pages divided into 15 chapters, dealing with the arrangement and construction of every type of crane, from the small "runway" to the giant hammer cranes handling weights up to 250 tons, and in Chapter VIII. a full description of the two 250-ton floating cranes for the Panama Canal are given. These were built by a German firm at about half the price required by the American and British firms who tendered for the work, which failed on the test load being applied. The descriptive matter is accompanied with numerous tables and data and some hundreds of illustrations, very many of which are folding plates. We heartily congratulate the author on what we can only describe as a wonderful production, entailing, as it must have done, an enormous amount of labour and care in the selection and compilation of matter, and we certainly recommend it to anyone interested in this subject.

BUSINESS NOTES.

Bankruptcy Proceedings.—William Ford, Swan Street, Alvechurch, lately trading as Redditch Electrical Accessories Co., Central Chambers, Unicorn Hill, Redditch, electrician.—The public examination of this debtor was held on December 11th at the Court House, Corporation Street, Birmingham. The statement of affairs showed a deficiency of £190. Debtor attributed his failure to bad trade caused by the general depression. It appeared that he commenced business in January, 1917, at his present address in partnership with another. On the death of his partner, he paid £7 to the widow in settlement of her husband's share. Another partner subsequently came into the business, which was removed to Redditch, but no capital was introduced by this gentleman. In January, 1920, the partnership was dissolved, debtor retaining the assets and liabilities. Another partner came into the concern, but owing to slackness of trade he obtained a situation in January, 1921. The case was adjourned to be closed.

F. Wilde (Liverpool Engineering Co.), electrical engineers, 18 and 20, Vauxhall Road, Liverpool.—Receiving order made December 12th on creditor's petition.

D. H. Griffin (Midland Electric Co.), electrical engineer, 5, The Mart, St. David's Road South, St. Annes-on-the-Sea. First meeting, December 22nd, at the Official Receiver's offices, Preston. Public examination, January 12th, at the Court House, Blackpool.

J. J. Smith (J. Smith & Son), electrical engineer, 1, Central Street, E.C.—Trustee, Mr. W. Boyle, Official Receiver, Carey Street, W.C., released December 6th.

S. Holmes (Holmes & Co.), electrical contractor, Palatine Chambers, Halifax.—Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford, released December 7th.

Harold Busfield and John James Whittaker, trading as Busfield & Co., Welfield Street, and carrying on business at 215, Padiham Road, as electrical engineers.—This examination took place at Burnley Bankruptcy Court on December 13th. Bad trade and want of capital was the alleged cause of failure. The deficiency totalled £222. Debtors entered into partnership in April this year. Neither had capital, but Busfield had £50 in stock and Whittaker £45 worth. They borrowed £100 from a friend. That amount was still owing. Busfield said the business had never shown any profit. Examination adjourned.

Company Liquidation.—Abbott, Anderson & Abbott, Ltd.—Winding up voluntarily. Joint liquidators, Mr. E. C. Moore, Thames House, Queen Street Place, E.C., and Mr. H. Sharp, 16, King Street, E.C. Meeting of creditors, December 28th, at Thames House, Queen Street Place.

Dissolution of Partnership.—Clarkson, Hood & Co., manufacturers' sales engineers, 45, Hope Street, Glasgow.—Mr. P. Clarkson and Mr. J. A. Hood have dissolved partnership. Mr. Hood will attend to debts and continue the business under the same style.

Receiver Appointed.—R. W. Robins & Co., Ltd., importers and exporters of everything electrical, London, Cardiff, and Cologne.—Mr. W. Gordon Waterman, 85, Queen Street, Cardiff, was appointed receiver for the debenture holder in this case on November 8th.

Catalogues and Lists.—Messrs. L. Andrew & Co., 2, Whitworth Street West, Deansgate, Manchester.—A priced catalogue of insulating materials for electrical purposes, including ebonite, asbestos, mica, presspahn, varnishes, tapes, &c.

Messrs. Johnson & Phillips, Ltd., Charlton, S.E.7.—List O.S., a well-illustrated brochure describing oil switchgear for panel mounting, for pressures up to 11,000 V and currents to 2,500 A.

Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester.—List A.24, giving illustrations, prices, and particulars of a wide variety of small electrical appliances and accessories, including wireless apparatus. Also an illustrated pamphlet dealing with sets and loud speakers for "broadcasting" reception.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A priced and illustrated pamphlet advertising four types of "Magnet" electric cookers and cast-iron kitchen utensils.

Messrs. Bruce Peebles & Co., Ltd., Edinburgh.—Pamphlet No. 18c, giving illustrations, details of construction, &c., of large-size open-type d.c. motors and dynamos. Dimensions are given in both British and metric units.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.—Monthly list (December) of motors and dynamos in stock.

The Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester.—An illustrated leaflet advertising "Lancashire" and "Crypto" motors.

Messrs. Giddings & Dacre, Ltd., Victoria Works, Chapel Street, Salford, Manchester.—A net trade price list of electrical materials and accessories, including switches, lighting fittings, conduits, fuseboards, &c.

The Parsons Motor Co., Ltd., Town Quay Works, Southampton.—Publication No. 56, containing drawings and specifications of engines for petrol, paraffin, or alcohol fuel of from 14 to 42 h.p. Fully priced.

Messrs. Ed. Bennis & Co., Ltd., 28, Victoria Street, S.W.1.—An illustrated brochure entitled "Diamonds and Dust," dealing with the utilisation of waste fuels in colliery boiler houses.

Messrs. Gyer, Hill & Gyer, 661-3, Harrow Road, Willesden, N.W.10.—A catalogue of surplus Government stores, including tools, accumulators, telephone equipment, &c.

Trade Announcements.—Councillor J. Walsh, electrical contractor, is opening new premises in King Street, Blackburn.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., announce that increased business in the Bristol area has necessitated their taking larger premises at 11, Nelson Street, Bristol, and henceforth all communications should be addressed there, where larger stocks of wires and cables, &c., will be carried.

Mr. J. C. White is removing to 49, Bridge Street, Manchester, where, in premises which have been specially designed, he will have offices, stores, workshop, and showrooms.

Messrs. S. G. Leach & Co., Ltd., write stating that Mr. R. F. Sunderland, of Milburn House, Newcastle-on-Tyne, ceased to represent them on November 30th, and all communications should at present be addressed to the head office, 26-30, Artillery Lane, London, E.C.

Calendars.—From Messrs. Mawdsleys, Ltd., of Zone Works, Dursley, Glos., we have received an extremely pleasing wall calendar for 1923. A maiden fair is wistfully "looking forward."

A wall calendar, useful and practical, with monthly date slips and the patent contrivance which fixes the date for you, has come to hand from Messrs. Mather Bros., of 36, Farringdon Street, London, E.C.4.

Messrs. Parsons Bros., of 49, Westgate Street, Gloucester, have issued a wall calendar, with monthly sheets, for 1923.

A pocket diary in case, with season ticket receptacle and insurance coupon, has been received from Mr. C. Selz, of 83, George Street, Portman Square, London, W.1.

A small "Mazda" lamp calendar of the popular order for 1923 has been issued by the B.T.H. Co.

Messrs. Bruce Peebles & Co., Ltd., have sent us one of their "Up-to-Date" desk calendars for the coming year. It is constructed of art metal and possesses a special mechanical arrangement for progressively cancelling the dates.

Book Notices.—"Molybdenum Ores," by R. H. Rastall. Pp. ix+86. London: J. Murray. 5s. net.

"Science Abstracts A. & B." Vol. XXV. Part 11. No. 299. November 30th, 1922. London: E. & F. N. Spon, Ltd. Price 2s. 6d. each net.

"Who's Who in Engineering" for 1923. London: The Compendium Publishing Co. Price 28s., plus postage in United Kingdom 1s. 3d.

The "Annales des Postes, Télégraphes et Téléphones," published by the French Government every two months, will be issued monthly from January next, without change in the price (27 fr. per annum abroad). The publishing office is La Librairie de l'Enseignement Technique, 3, Rue Thénard, Paris.

We have received from the Board of Education copies of the "Arrangements and Conditions for the Award of the National Certificates and Diplomas of the Institution of Electrical Engineers in Conjunction with the Board of Education." Copies can be obtained from H.M. Stationery Office, price 1d. net.

"M. & C. Machine Mining," December. Glasgow: Messrs. Mavor & Coulson, Ltd.—This issue contains a number of interesting articles upon coal-winning by mechanical means, including a description of the "M. & C." chain coal-cutter, and an account of the undercutting of four acres of coal in six months.

"The *Bulletin* of the Hydro-Electric Power Commission of Ontario," October, 1922. In this issue a history of the development and work of the Commission is commenced; the first instalment presents the case for public ownership of undertakings of national necessity. Another article pays attention to complaints which are put forward in ignorance of facts by consumers, showing the necessity of educating the public electrically. An interesting article comparing domestic heating by means of coal fires and electricity appears. Inserted in this issue is the first copy of "The Hydro Lamp," a publication which is to be produced monthly for public distribution.

Christmas Messages.—During the Christmas period Marconi's Wireless Telegraph Co., Ltd., is delivering its radio messages in a specially designed envelope. The word "Marconigram" appears diagonally in decorative characters, and the phrase "Season's greetings" is placed above and below it.

Phosphor Bronze.—Messrs. Charles Clifford & Son, Ltd., of Fazeley Street Mills, Birmingham, who are specialising in the manufacture of phosphor bronze sheets, rods, tubes, and wire, report increasing demands therefor from the makers of broadcasting and wireless sets.

A Birmingham Exhibition.—The International Foundry Trades Exhibition will be held in Birmingham in the early summer of 1924. The arrangements will again be in the hands of the Birmingham Chamber of Commerce and the British Cast Iron Association. The next exhibition, it is expected, will be more international in its character than was the exhibition held this year, which was the first of the kind to be held in this country.

Works Closed for the Holidays.—The works of the London Electric Firm at Croydon will be closed from to-night, Friday, until Thursday morning, December 28th.

The works of the Electric Heating Co., George Street, Croydon, will be closed on December 22nd, and will be re-opened on Tuesday, January 2nd.

Inquiries Regarding Canadian Trade.—Mr. G. T. Milne, O.B.E., H.M. Senior Trade Commissioner in Canada, who is shortly retiring from the Trade Commissioner Service, is at present in this country and, until the end of the year, can be interviewed by appointment at the Department of Overseas Trade by manufacturers and merchants who are interested in trade with Canada. Communications should be addressed to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

Annual Dinner.—The staff and employés of the Southport Corporation Electricity Department held their annual dinner on December 12th, the chairman (Mr. Councillor Little), and vice-chairman (Mr. Councillor Owen) of the Electricity Committee, being present. The Chief Engineer (Mr. E. Moxon) thanked his staff for their loyal and energetic co-operation during the past twelve months, and expressed his conviction that with a continuance of this spirit the department would very soon be in a position second to none of the undertakings of a similar size and character.

Socials.—The Newcastle Branch of the General Electric Co., Ltd., held its first dance of the season on December 1st, when 140 of the staff and their friends spent a most enjoyable evening. Artistic decorations in the ballroom were carried out by the Illuminating Engineering Department, and music was rendered by Mr. H. Tuff's orchestra, which was ably assisted by Mr. C. N. Baston, Newcastle staff.

The second annual dinner of the staff of the Leatherhead and District Electricity Co., Ltd., was held on Friday, 15th instant, at the "Running Horse," Leatherhead, at 7.30 p.m. The dinner was followed by vocal and instrumental music, given by members of the staff. Mr. Griffiths, musical director at the Royal School for the Blind, acted as accompanist, and contributed several items to the programme. On the following Monday, Mr. Norman Land, Bookham, was presented with a silver cigarette case on the occasion of his leaving the works to go to Australia. The presentation was made by the manager, Mr. Horner.

Electric Lamp Production in Russia.—The Chief Concession Authority is negotiating with the international concern Osram-Phillips-General Electric Co., of New York, for the organisation of electric lamp production in Russia.

Trade Union Consolidation.—Thirty-five unions in the metal trades have been invited to send delegates to a conference to discuss the possibilities of amalgamation. The conference, which has been called by the general council of the Trade Union Congress, will be held in Manchester in the first week of February. The unions invited include the Amalgamated Engineering Union, and the total membership represented will be over 700,000. Fifteen of the textile unions, apart from cotton operatives, have also been invited to a conference at Bradford early in February, to discuss amalgamation. The aggregate membership represented at that conference will be nearly 160,000.—*The Times.*

Applications for British Trade Marks.—Appended is a summary of the recent applications for British trade marks in respect of goods and productions connected with the electrical trades and industries. Individuals or firms desiring to enter an objection to any of the applications have one month in which to do so from the dates given below:—

P. G. (lettering and design). No. 429,687. Class 5.—Copper wire. No. 429,688. Class 8.—Electric cables. Pirelli-General Cable Works, Ltd., 144, Queen Victoria Street, London, E.C. December 13th, 1922.

Penguin. No. 428,011. Class 6.—Electrically-driven air-circulating fans. Percy Smith Brook, "Elsinore," 15, Curzon Park, Chester. December 13th, 1922.

Ionophone. No. 426,643. Class 8.—Wireless telephony receiving apparatus. John Henderson, "Kinnoull," Gregorys Road, Beaconsfield, Bucks. December 13th, 1922.

Eureka. No. 429,557. Class 8.—Instruments and apparatus for use in wireless telegraphy and telephony. The Electric Appliances Co., Ltd., Fisher Street, Holborn, London, W.C. December 13th, 1922.

Gecohma. No. 430,279. Class 8.—Electrical measuring instruments. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C. December 13th, 1922.

Ohmerette. No. 430,660.—All goods in class 8. Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, London, E.8. December 13th, 1922.

Milan Hotel Equipment Exhibition.—The Department of Overseas Trade is informed by H.M. Consul-General at Milan that the Touring Club Italiano of Milan intends to hold a special exhibition of articles of hotel equipment in conjunction with the annual International Samples Fair at Milan, to be held from April 12th to 27th next year.

Iron and Steel Trade in 1922.—In the course of their annual report, Messrs. Bolling & Lowe, Ltd., say that the iron and steel trade appears at least to be very gradually recovering from the unparalleled depression of approximately the last two years, but when one takes into account the present maximum production, compared with 1914, brought about by extensions and improvements in old works and the erection of new works, it is impossible to forecast when the industry as a whole will be fully and profitably employed. The improvements in trade which were constantly predicted by some financiers and experts during the first six months of the year did not materialise, and the few spurts noticeable from time to time died away to be followed by further depression. "Today we are in a position to recognise that work will be forthcoming in the near future, if only by Government guarantees to give employment to some of the vast army of willing and anxious workers, who through no fault of their own or of their employers have been reduced in many instances to poverty and distress. For some time past many employers have accepted contracts without profit, and in several cases at a loss to keep their workers together, but this state of affairs cannot continue indefinitely."

After briefly reviewing the course of trade and the prospects in most parts of the world, Messrs. Bolling & Lowe conclude their report as follows:—"The year 1922 will stand out as a period of difficult trading, heavy losses, and erratic exchanges, but we look forward with a certain amount of optimism to the New Year, and feel sure that if the Government practise the promised economies, further reduce taxation, and allow the free development of international trade, our next annual review will be of a more encouraging nature than we have been able to write in 1921 and 1922. The stabilising of the exchanges in Europe, admittedly a most difficult problem, would go a long way to the restoration of more normal conditions."

New Belgian Companies.—There has been formed at Schaerbeek (107, Rue Joseph Coosemans) a company styled Electro-Matériel Roba et De Cock, with the object of the import, export, and sale of electrical material of all kinds.

With a capital of 50,000 fr. has been established at Charleroi the Electricité et Industrie, a company for the manufacture and installation of electrical material generally.

A Large Canadian Transformer Order.—The Ferranti Meter and Manufacturing Co., Toronto, has just closed what is said to be the largest order for transformers ever placed in Canada for export. The Southland Power Board of Invercargill, New Zealand, has placed an order with this Canadian company for 200 distribution-type transformers, three-phase, 11,000 V, in five, ten, fifteen, twenty, and thirty-kVA sizes. The transformers will be designed for 50-cycle circuits, and will be delta connected on the high-pressure side and star connected on the low-pressure side. This order was obtained in competition with German, Swedish, English, and United States firms; the order was placed on a quality, and not a price basis, the competing tenders being lower than the Canadian firm's figures. The Ferranti Co. submitted with its tender a sample transformer built to the New Zealand specifications, and the award was largely influenced by the details of transformer construction, coil impregnation, and the welded steel tanks.—*Electrical News.*

Window-dressing Prizes.—At a shopping week window-dressing competition held at Southend-on-Sea, prizes were offered for the best electrical window display. The first award went to Mr. H. J. Bell, Hamlet Court Road, and the second to the Westcliff Electrical Co., West Road.

French Capital in the Saar.—French interests and Saar banking firms have formed the Ateliers d'Appareillages Electriques, S.A., at Fraulautern, Saar, for the production and sale of electrical equipment and machinery, the share capital of 30,000,000 marks having been taken up by the promoters.

Lead.—In their last report (December 16th) Messrs. James Forster & Co. state:—"The increase in imports this year, as compared to last, which amounts to no less than 44,717 tons, or about 4,000 tons a month, is sufficient evidence that consumption is well on the up grade, and there is every indication of this being maintained and increased in the New Year. The price of lead is high, and should materially increase production, but of this there is little evidence. The Board of Trade returns for November show:—Imports, 10,429 tons; exports, 4,052 tons, leaving for home consumption 6,377 tons, and leaving for home consumption for 11 months, January-November, 131,473 tons."

Copper and Lead Prices.—Messrs. F. Smith & Co. report, December 19th: Copper (electrolytic) bars, £69 15s., 5s. increase. Ditto ditto sheets, no change. Ditto ditto wire rods, £79 15s., 5s. increase. Ditto ditto h.c. wire, no change.

Messrs. James & Shakespeare report, December 19th: Copper bars (best selected), sheet, and rod, and English pig lead, no change in last week's prices.

Industrial League Lectures.—The January arrangements for Caxton Hall meetings of the Industrial League and Council are as follows:—

January 3rd.—Sir Geo. Paish on "The Value of Capital."
January 10th.—Mr. Tom Kennedy on "The Basis of Wages."
January 17th.—Sir Ernest J. P. Benn, Bart., on "A Talk About Economics."
January 24th.—Mr. H. H. Elvin on "Education as a Function of Management."
January 31st.—Sir Arthur Holbrook, K.B.E., M.P., on "Industrial Liberty."

Electricians' Wages.—A meeting was held last week in Glasgow between representatives of the Electrical Contractors' Association and the Electrical Trades Union to consider wages. The employers made a final offer of a reduction of 2½ per hour, from 1s. 7½d. to 1s. 5d., together with a reduction in outworking allowances from 3s. to 2s. 6d. per night; the new rate to commence on January 1st and to be stabilised until May 1st; further revision to take place during April. This offer is being submitted to the members of the Union for consideration.

A Permanent Exhibition at Prague.—The journal *International Commerce* has sent us a publication in four languages announcing its organisation of a permanent commercial exhibition at Prague. The display is to be housed in a building erected for the purpose, and it is proposed to divide it according to nationalities, showing both the products of foreign countries and Czecho-Slovakian goods suitable for export to those countries. The address of *International Commerce* is Prague-Smichov, Palackého trida, 38/1/9.

The Manchester Steam Users' Association.—The Memorandum by the chief engineer (Mr. C. E. Stromeyer) for the year 1921 has just been issued after some delay, first by boiler tests, which have had to be omitted, and then by a Home Office move with regard to the form of reporting on the inspection of factory boilers. A protest against the alterations has been entered, although the inspection service of the Association fully safeguards members. Mr. Stromeyer makes a number of suggestions with regard to economic boiler design, and concludes with an exhaustive analysis of experiments on the specific heat of steam.

Sequestration.—Martin & McGregor, electrical engineers, Coltness Road, Wishaw.—A meeting to elect the trustee and commissioners was called for December 19th at the County Buildings, Hamilton. Mr. F. J. Mackenzie, 55, West Regent Street, Glasgow, agent.

G.W.R. Pumping Plant Contract.—The Great Western Railway Co. has placed with the Pulsometer Engineering Co., Ltd., of Nine Elms Ironworks, Reading, a contract for the supply and erection of a hydraulic pumping installation consisting of four Pulsometer turbine centrifugal pumps designed for a working pressure of 800 lb. per sq. in. Each pump is to be direct coupled to an electric motor of 650 b.h.p. (a total of 2,600 b.h.p.), for a pressure of 6,000 volts. The pumps will each be capable of delivering 800 gallons of water per minute. Auxiliary low-pressure pumping machinery and switchgear for automatic operation are included in the contract, the latter embodying features which are of considerable electrical interest. The installation is intended for the dock service of the G.W.R. at Cardiff. We are informed that the order was secured in the face of strong British and foreign competition.

LIGHTING AND POWER NOTES.

Ashton.—Electricity Order.—The town clerk has suggested that the Limehurst Council should apply for an Order to supply electricity in bulk, and then assign the powers to Ashton.

Australia.—Victoria.—A loan Bill has been introduced in the Victoria Legislative Assembly providing for the raising of a sum of £1,500,000 for works in connection with the State electricity scheme.—*Reuter* (Melbourne).

Barnsley.—Loan.—The Town Council has applied to the Electricity Commissioners for a loan of £16,500 to meet excess expenditure on previous loans, and for prospective work.

Blackburn.—Loan.—The Town Council has decided to borrow £60,000 for the laying of electricity mains, &c.

Bristol.—Year's Working.—The report for the year ended March 31st, 1922, shows that the revenue earned by the city electricity undertaking (engineer: Mr. H. Faraday Proctor) amounted to £345,139, as compared with £303,930 in the previous year. The working expenses remained at about the same level, £238,324, as against £236,409, leaving a gross profit of £106,815 (£67,521). The final result was a net profit of £31,925, over four times that of 1920-21—£6,864. Of this amount £10,767 was transferred to capital account, and £13,904 contributed to the general district rate. A total of £123,584 was spent on capital account during the year, the largest single item being £66,172 for mains and services. The sales of energy increased from 33,529,417 kWh in 1920-21 to 37,079,702 kWh, and the maximum simultaneous load from 15,336 to 15,972 kW. The system now has a total cable mileage of 437.

Chippenham.—Electricity Scheme.—The Town Council has referred to a committee a communication from the Western Electric Distributing Corporation, proposing an electric lighting scheme for the town and district.

Clowne.—Electricity Supply.—The Parish Council has decided to approach the Stavely Coal and Iron Co., Ltd., with a view to obtaining a supply of electricity for the district from Barlborough Colliery. The company's electrical engineer has expressed willingness to comply with the request, and advises the formation of a subsidiary company to carry out the scheme.

Continental.—Moravia.—It is reported that four companies have been formed in Moravia for the purpose of the systematic electrification of the country. A special region has been allotted to each company. The programme of works includes the utilisation of the river Dyje between Freinstyn and Znojmo. In order to provide the funds necessary for the project the Moravian administration has decided to contract a 4½ per cent. loan in communal bonds of the Moravian Mortgage and Agrarian Bank for a total sum of 30,000,000 kronen.—*Reuter's Trade Service* (Prague).

Formby (Lancs.).—Special Order.—The Urban District Council has referred to a committee a communication from the Western Electric Distributing Corporation, proposing an electric lighting scheme for the town and district.

Heckmondwike.—Electricity in Bulk.—An agreement has been reached between the District Council and the Yorkshire Electric Power Co. for the supply of electricity in bulk by the company to the Council in place of the latter's maintenance of separate generating plant. In April last it was reported that the loss on the local electricity works was £2,950, and a further loss of £2,000 on the current year's working is anticipated. Since 1919 the aggregate loss on the undertaking has amounted to nearly £10,000.

Highbridge (Somerset).—Street Lighting.—The Urban Council has decided to approach Messrs. Kennedy & Co. with a view to lighting the streets by electricity.

Hitchin.—Inquiry.—A public inquiry was held by the Electricity Commissioners at the Town Hall on the 5th inst. into the question of electricity supply for the town. The Urban District Council is opposing the application of the Electric Supply Corporation, Ltd., for a Special Order authorising the company to supply electricity in the district. The Council is desirous of making its own arrangements for an electricity supply.

Holmfirth.—Electricity in Bulk.—At a meeting of the Urban District Council last week it was reported by the Electricity Committee that the electrical engineer had been authorised to dispose of the Bates & Scholes engine in the generating station as a preliminary to the change of system, under which electricity will be bought in bulk. The Electricity Commissioners have sanctioned the borrowing of £5,000 for the necessary work in connection with the change. A petition was received from ratepayers asking for the extension of electricity supply to Dunsley, Malkinhouse, and Ward Place, but the Council decided that the extensions could not be carried out at present. The proposals will be reconsidered at a later date.

Inverurie.—Scheme Abandoned.—The Town Council has abandoned the scheme for electric lighting of the burgh on account of the cost involved.

Irish Free State.—Dublin.—*New Plant.*—The Corporation has applied to the Free State Minister of Industry for an Order authorising the installation of the necessary plant for a supplementary supply of electricity to Rathmines and Pembroke. The Electricity Committee is installing two new Babcock boilers at the Pigeon House power station.

Leeds.—Loan.—The City Council is applying to the Electricity Commissioners for sanction to the borrowing of £80,000 for electricity purposes.

London.—Bermondsey.—The Borough Council is reducing the price of electricity by ½d. per kWh, the flat rate for lighting to be 7d., and for heating and cooking 2½d. per kWh, less 20 per cent.

St. Pancras.—*Loans.*—The Council has received the permission of the Electricity Commissioners to borrow the sum of £27,373 for electricity purposes; the amount of the application was £36,640. The disallowed amount includes an item for cables which should have been charged against a previous loan; provision for the conversion of a building into a sub-station is to be treated separately; and a contribution to the purchase of certain land is also disallowed. Application is being made for sanction to borrow a further sum of £17,382.

Converting Plant.—Although the contract with Messrs. Hulton & Co. for a large annual supply has not been signed, the electrical engineer recommends that the installation of the two motor converters at Tavistock Place be proceeded with in view of the increasing demands in the area. A similar set is to be installed in the King's Road station, and both contracts have been awarded to Messrs. Bruce Peebles & Co., Ltd.

Marlborough.—Electricity Supply.—The Town Council has decided to accept the offer of Marlborough College to join in an electricity scheme. Mr. H. Leaf, a former assistant master, has given £30,000 towards the cost of the scheme.

Menai Bridge.—Electricity in Bulk.—A scheme for a bulk supply of electricity from Bangor to the Menai Bridge Council is now complete. Originally it was proposed that the cable for the supply should be laid over the suspension bridge and continued to the sub-station proposed to be built on a site behind the Council's offices. Owing to certain difficulties which have arisen, it is now proposed to lay the feeder cable by a more direct route across the Straits. This will reduce the capital expenditure by at least £250. It is estimated that the scheme will cost £3,971.

New Zealand.—Wellington.—In connection with the proposal by the electricity supply authorities in Wallington to raise the voltage of the a.c. distributing system from 105 to 230 V as soon as the necessary electrical energy can be supplied from the new hydro-electric power station at Shag Point, Evans Bay, H.M. Trade Commissioner at Wellington reports that the proposed alterations have been definitely approved by the City Council, but no decision is expected to be arrived at for some six months as to whether tenders will be invited for the supply of the material required, or whether the work will be given out to local contractors. The scheme is expected to involve an outlay of from £50,000 to £100,000.

Nottingham.—New Generating Station.—Substantial progress is being made with the new generating station which is being built by the Corporation upon a site contiguous to the River Trent at Clifton, a suburb of Nottingham. Speaking at a recent assembly of the Nottingham and District Association of Building Trade Employers, Mr. W. J. Broad, the town clerk. said that the machinery at the station was now well in hand, and within the next two years it would be completed. In the Corporation Bill now before Parliament they were asking for powers to supply energy to districts outside the city. He did not know how these districts would receive the proposals, whether they would think that Nottingham had an ulterior motive, but he assured them that there was nothing of the kind in view.

Portsmouth.—Price Reductions.—The Town Council is reducing the charges for electricity from the end of the year as follows:—Lighting, first 5,000 kWh to 6½d. per kWh; 5,000 to 10,000, 5½d. per kWh; 10,000 to 20,000, 4½d.; beyond, 4d.; power, by ½d. per kWh; street lighting, by 5s. per annum for small lamps, and by 20s. per annum for large lamps. The minimum annual charge for electricity supplied through one meter only will be reduced from 35s. to 32s. 6d.

Loans.—Application has been made to the Electricity Commissioners for sanction to the borrowing of £31,000 for additional plant and £40,000 for mains and services.

Reigate.—Price Reductions.—The Town Council is reducing the charges for electricity from the meter readings at the end of the year from 9d. to 8d. per kWh for lighting, from 6d. to 4d. per kWh for heating, and from 4d. to 3d. per kWh for power.

Romsey (Hants.).—Electricity Supply.—The Romsey Gas and Coke Co. has informed the Rural Council of its intention to apply to the Electricity Commissioners for powers to supply electricity in the borough and district. The Council has decided to offer no opposition.

Sheffield.—Loan.—The Electricity Committee has recommended that application be made to the Electricity Commissioners for sanction to the borrowing of £23,000 for electricity purposes.

Southend.—New Plant.—The Town Council has decided to purchase three marine-type Diesel engines, at a cost of £5,500 each, and application is to be made to the Electricity Commissioners for sanction to borrow the necessary amount to cover the purchase.

Southport.—New Plant.—Mr. E. Moxon, borough electrical engineer, has reported to the Council that the Brush Electrical Engineering Co., Ltd., has made good progress with the erection of the new 1,500-kW turbo-alternator, and that there is every likelihood of the set being available for commercial service early in the New Year.

Sunderland.—Loan.—The Corporation is applying to the Electricity Commissioners for sanction to the borrowing of £6,000 for services.

Swinton and Pendlebury.—Electricity in Bulk.—The Urban Council has entered into an agreement with the Lancashire Electric Power Co. for a supply of electricity in bulk. The Council is to pay a charge of £4 10s. per kW per annum, plus 0.25d. per kWh, with coal at 20s. per ton, the coal variation to be .011d. per shilling. The agreement is for a period of 10 years.

Tilbury.—Electricity Supply.—The Urban Council has decided to take up the question of an electricity supply with the County of London Electric Supply Co. and the Electricity Commissioners with a view to an early supply being obtained, or the cancellation of the company's Romford Order, and authority being obtained for the Council to carry out a scheme.

Wantage.—Electricity Supply.—Sir Charles Bright and Partners recently informed the Urban Council that the Western Electric Distributing Corporation had instructed them to apply for a Special Order authorising it to supply electricity to the town. They added that the finance was available for carrying out the work immediately an Order was granted. The Council expressed approval of the scheme.

TRAMWAY AND RAILWAY NOTES

Bradford.—Tramway Extensions.—The Corporation Tramways Committee has been reminded by the Bingley District Council that the extended period for completion of the tramways extension from the existing Crossflats terminus to the Bingley boundary along Keighley Road expires on February 7th, 1923. The Bingley Council is applying for a further year's extension, and urges the Corporation to consider the advisability of completing the work during that year. The Committee has decided to ask Keighley Corporation what prospect there is of its tramways being extended from Stockbridge to the Bingley boundary, with a view to linking up to the Bradford system when extended.

Track Renewals.—With regard to the Nab Wood section of the Corporation tramways within the area of the Shipley District Council, the Shipley Council suggested that in view of the need of renewal of the track the Corporation should at once commence reconstruction on behalf of the District Council, without waiting for formal execution of the agreement between the two authorities. The Committee agreed to act on the suggestion and tenders for the work have been obtained.

Continental.—Spain.—La Compañia del Tranvia Electrico de Aviles has recently secured a concession for the construction and working of an electric tramway between Piedras Blancas and Cardeco.

Germany.—It is stated that out of the total network of German railways, 272 miles is at present being operated by electricity and a further length of 505 miles is in course of electrification. The latter is centred in Munich, and the lines proceed towards the south and the south-west, so that eventually all the Bavarian South-Eastern system will be worked electrically.

Derby.—New Route.—The Town Council has decided to extend the tramways in Ormaston Road, at a cost of £21,800.

Leeds.—Loan.—The Corporation proposes to borrow £79,500 for repairing tramcars and making bodies for new cars.

London.—The City and South London and the London Electric Railway Companies propose to make improvements at the Elephant and Castle Station by installing escalators and providing improved booking facilities.—*The Times.*

L.C.C. Tramways.—*Track Renewals.*—Owing to the improved financial position, the Highways Committee of the L.C.C. reports that it will not be necessary in the 1922-23 period to charge half the cost of track renewals to capital account, as has been done, with Government consent, in the three previous years.

Agreements.—The Highways Committee recommends that agreements be entered into with the Metropolitan Electric Tramways, Ltd. (*a*) with regard to the Harrow Road tramway, and (*b*) to provide through services between Aldgate and Euston, Aldgate and Wood Green, and between such other points as may be agreed upon by the managers of the two undertakings.

Richmond Tube Scheme Postponed.—The proposed extension of the Central London Railway from Shepherds' Bush to Richmond has been postponed in view of the fact that the Piccadilly tube is to be extended to Turnham Green from Hammersmith, and will serve part of the same district. It is thought advisable to see what effect the Piccadilly line extension has upon the traffic before proceeding with the extension of the Central London Railway.

L. & N.W. Railway.—Electrification.—A conference of representatives of Oldham and Rochdale Town Councils and six urban district councils in the area was held at Oldham on December 14th, when a resolution was passed urging the L. & N.W. Railway Co. to press on with the electrification of the railway, between Manchester, Oldham, and Rochdale. This, it was contended, would enable better services to be run, whilst the scheme would provide work for the unemployed.

Mexico.—Railway Electrification.—The directors of the Mexican Railway have decided to adopt electrical working on part of the main line. For the present the work will be confined to the mountain section, where the line rises over 4,000 ft. in a distance of some 29 miles. The total cost of the equipment and track work is estimated at about £500,000, and a contract has been entered into for a supply of electric locomotives under which the terms of payment are spread over a period.—*The Times.*

Preston.—Year's Working.—The report of the engineer and manager of the Corporation Tramway undertaking (Mr. J. F. Simpson) for the year ended March 31st last, records a total income of £99,318, comparing with £96,482 in 1920-21. Working expenditure amounted to £75,853, as against £85,458, leaving a gross balance of £23,465 (£11,024). Capital charges, &c., reduced this to £4,567, which compared favourably with a deficit of £6,806 in the previous year. The net profit was reduced by a loss of £87 on the motor omnibuses. Both car-mileage and the number of passengers carried were reduced, the former from 1,209,867 to 1,190,220, and the latter from 15,885,352 to 13,260,659. The capital expenditure during the year amounted to £5,363 for the tramways, and £4,849 for the motor omnibuses.

South Africa.—Railway Electrification.—It is anticipated that steps will be taken in the near future for the construction of an electric railway to run between Johannesburg and Pretoria.

Wakefield. — Inauguration of Omnibus Service. — The Yorkshire (West Riding) Electric Tramways Co., on December 12th, formally opened its latest public utility service, namely, a large fleet of motor omnibuses operating over a wide area. A well-equipped public shelter was opened in the afternoon in the centre of the city by the Mayor of Wakefield (Coun. H. H. Holdsworth). This shelter contains a parcels office, inquiry bureau, and a street telephone cabinet available for day and night service.

The tramway service was opened in August, 1904, and it links the city by a through service to Leeds, the metropolis of the West Riding of Yorkshire, and there are also routes extending into the country districts south and west of Wakefield, as well as a very popular route joining up to Ossett, and linking up Wakefield with the whole of the Heavy Woollen area. In all there are 40 miles of single track, including the lines at Normanton, Castleford, and Pontefract, which were laid some years after the Wakefield service was commenced. There are 75 cars in use on the tramway service, running 1,730,000 miles per annum and carrying 15,000,000 passengers. The company has power stations at Belle Isle (Wakefield) generating 4,000,000 kWh per year, and there are car depôts at Wakefield, Ossett, Rothwell, and Castleford.

A few months ago the company inaugurated a motor-'bus service, using 22 cars of the "Bristol" type, and operating over routes covering 116 miles. The complete tramcar and 'bus service is now running in areas controlled by 54 local authorities, the districts including Barnsley, Dewsbury, Shelley (near Huddersfield), Morley, Normanton, Pontefract, Castleford, Hemsworth, Knottingley and Ferrybridge. The population served by the tramways is 175,701, and it is estimated that that number has been more than doubled by the introduction of the latest service. It is estimated that 201,000,000 passengers have been carried since the tramway company's service was opened.

The introduction of the new 'bus service necessitated extensive alterations at the company's central depôt at Wakefield, and to accommodate the cars a huge steel frame garage has been erected, 200 ft. long and 80 ft. wide (in one span).) This garage was formally opened by the Mayor of Wakefield following the ceremony at the public shelter in the city.

TELEGRAPH AND TELEPHONE NOTES.

Belgium.—Automatic Telephones.—The first automatic telephone office in Belgium has just been opened at Uccle, Brussels.

Denmark.—Radio-Telephony.—Interest in radio-telegraphy and telephony in Denmark is enormous, and it may almost be said to be an epidemic. Wireless clubs have been formed all over the land. The law has, however, stepped in and placed a ban on the amateur telegraphist, and it has been made punishable to transmit signals. Those found guilty are punished by the confiscation of their apparatus and fines up to 400 kroner. The public opinion is, however, that the State has blundered, and, notwithstanding the law, many small stations are in operation surreptitiously all over the country.—*Svensk Trafiktidning.*

France.—Telegraph Tolls.—The charges for telegrams to foreign countries, with the exception of French colonies and protectorates, have again been raised in accordance with the readjusted value of the gold franc. The rates for messages sent by wire and for those sent by wireless are identical.—*Reuter.*

Holland.—New Radio Station.—The Dutch Government is establishing a powerful radio station at Kootwyk, in the province of Gelderland, covering an area of 750 acres. Another station for receiving will be established 30 miles southward. Five masts, 700 ft. high, have been erected at Kootwyk, weighing 100 tons each. The work is being directed and the materials supplied by the German Telefunken Co. The station is expected to be ready for service at the end of the year, and will be equipped with a special duplex system to receive and send simultaneously to and from Java, 7,500 miles distant. —*Electrical News.*

Irish Free State.—Telegraphic Communication Interrupted.—It was stated at the Dublin Post Office on December 18th that all telegraphic communication between the Free State capital and the south of the island had been cut off.—*Daily Mail.*

The Telephone Service.—Foreign Tariffs.—In pursuance of the Telephone Regulations, 1922, the Postmaster-General gives notice that the charges for telephonic communication from January 1st, 1923, between Great Britain and Switzerland have been fixed as specified in the *London Gazette* of December 15th.

Installation Speed-up.—New telephone subscribers in the City are having their instruments installed with much less delay than there was a year ago. Mr. Neville Chamberlain, Postmaster-General, told the *Daily Express* that in 50 per cent. of cases service is now provided within a fortnight and in more than 75 per cent. of cases, within three weeks. The number of applications now outstanding does not exceed two or three dozen.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Melbourne.—January 24th. Tramways Board. 1,650 steel poles, either solid or in three sections.

March 7th. Electricity Commissioners. Ash and dust extraction plant. (December 15th.)

January 24th. Victorian Railway Department. Insulated copper wire.*

January 31st. Three-phase a.c. motors, starting apparatus, and accessories for the Newport workshops (17 enclosed squirrel-cage motor sets, 2 h.p. to 20 h.p., two enclosed slip-ring motor sets, 25 h.p. to 30 h.p.).*

January 31st. Impendance bonds for power signalling; 100 three-position line relays; accumulators and accessories.*

Postmaster-General's Department. January 8th. Operators' calling devices. January 11th. Switchboard cable. January 17th. Telephone and telegraph apparatus. January 24th. Testing and telegraph instruments. February 22nd. Switchboard parts. March 1st. Telephone and telegraph parts. (See this issue.)

Sydney.—January 31st. New South Wales Railways Department. Four 1,000-kW rotary converter sets.

January 29th. Municipal Council. Feeder protective apparatus for sub-stations.*

Newcastle (N.S.W.).—January 11th. Town Council. 750-kVA or, alternatively, one 1,000-kVA transformer voltage regulator.

Basford (Nottingham).—January 1st. Board of Guardians. Economiser. (December 15th.)

Birmingham.—January 27th. Salvage and Stables Committee. Plant for the refuse destructor and salvage works:—One 3-wire balancer set and switchgear for lighting purposes; two 110-kW steam-driven generator sets, with switchgear and condenser; one 5-wire balancer set, with switchgear and charging panels, for electric vehicle charging; paper press; scrap-iron press; hydraulic accumulator and pumps. (December 15th.)

Cheadle and Gatley.—January 1st. Urban District Council. Sub-station switchgear and static transformer. (December 15th.)

Chile.—January 13th. State Railways. Covered copper wire, g.i. wire, g.i. cable, porcelain insulators, insulator pins, telegraph cords, &c.*

Dundee.—Corporation. Electric lighting installation at the public market. Particulars from City Architect.

Egypt.—Alexandria.—January 17th. Ports and Lighthouses Administration. Stores, including electrical goods, for 12 months.*

France.—Calais.—Tenders will be invited shortly in connection with electric lighting and power installations at Calais. Particulars from the Mairie, Service des Travaux, Calais.—*Reuter's Trade Service* (Paris).

Hunslet.—December 30th. Board of Guardians. Electric wiring of houses at Halton, near Leeds. Mr. W. P. Pindar, clerk to the Guardians, Leek Street, Hunslet, Leeds.

Huntingdon.—January 3rd. Huntingdonshire County Council. New heavy-plate type battery, 400-420 amp. hours. (See this issue.)

India.—Madras.—January 18th. Corporation. Eight 30-kVA, 3-phase transformers; h.p. switchgear; 15,000-V testing set; 700 30-ft. steel tubular poles; 10 tons h.d. copper wire, No. 8 gauge; 6 tons g.i. wire, No. 8 gauge; switchboard instruments. Specifications, &c., Revenue Officer, Corporation of Madras (Rs.1 per set.)

Manchester.—January 1st, 1923. Rivers Committee. Conversion of Davyhulme sewage works, Urmston, from steam to electric drive. Secretary, Rivers Department, Town Hall, Manchester.

South Africa.—BRANDFORT, O.F.S.—January 30th. Municipal Council. Water-tube steam boilers, steam engines and alternators, switchboard, boiler and engine-house auxiliaries, steel poles and overhead conductors (erected), transformers, house services and meters. Prof. W. Buchanan, 75, Louis Botha Avenue, Johannesburg.

CAPE TOWN.—January 12th. City Council. 10,300 yd. h.p. and l.p. cable; three 150-kVA single-phase transformers; four 100-kVA ditto; three 40-kVA ditto.*

Stoke-on-Trent.—January 10th. Electricity Department. Neutral earthing resistance. Twelve months' supply of static transformers, sub-station switchgear. (See this issue.)

Uruguay.—MONTEVIDEO.—January 16th. State Electricity Works. 45,000 metres v.i.r. cable.*
December 29th. L.p. armoured cable, telephone cable and accessories.*

Wolverhampton.—January 17th. Electrical Engineer's Department. One 5,000-kW turbo-alternator, condenser and auxiliaries. (December 15th.)

*A copy of the plan, specification, and conditions of tender, &c., can be inspected at the Department of Overseas Trade (Room 84), 35, Old Queen Street, S.W.1.

CLOSED.

Barnes.—Urban District Council. Accepted:—
Turbo-alternator, condenser, and switchgear.—English Electric Co., Ltd.
Rotary converter.—Mather & Platt.

Dublin.—Streets Committee. Recommended:—
Two electrically-driven centrifugal pumps.—J. Cochrane & Co.
Irish Builder and Engineer.

East Grinstead.—Urban Council. Accepted:—
Overhead crane (£115).—Holt & Willetts.
Main switchboard (£762).—Park Royal Engineering Co.
Mains (£5,451).—G. E. Taylor & Co.
Storage batteries (£1,789).—Crompton & Co.
Engines and dynamos (£4,196).—Vickers, Petters, Ltd.

Falkirk.
Electrical work for the extensions at the works of F. Johnston & Co., *Herald* office.—T. Laurie & Co.

Glasgow.—Tramways Committee. Recommended:—
Two rotaries and switchgear for Bearsden sub-station.—Metropolitan-Vickers Electrical Co., Ltd.
Rubber and asbestos goods.—N.B. Rubber Co., Ltd., and Rubber Co. of Scotland, Ltd.
Corporation. Committee on Libraries. Recommended:—
Portable electric vacuum cleaning machine (£30).—Frame & Barr.

India.—CALCUTTA.—Corporation. Pumping installations at the Pulta and Tallah pumping stations. Three steam-driven pumping engines, boilers, stokers, coal-handling plant, and electrically-driven auxiliaries. According to the *Times Trade Supplement*, tenders were received from Fraser & Chalmers (£142,376) and C. A. Parsons & Co. (£156,978). The engineer-in-charge of the waterworks, Mr. Coats, recommended the acceptance of Messrs. Fraser & Chalmers' tender solely on the ground of its being substantially cheaper. On the other hand, Messrs. Moore & Bateman, consulting engineers to the Corporation, advised the acceptance of Messrs. C. A. Parsons and Co.'s tender. The difference between the two estimates was about Rs.2 lakhs. It was decided that a further reference should be made by cable to Messrs. Moore & Bateman for their opinion.

London.—ST. PANCRAS.—Electricity and Public Lighting Committee. The Committee recommends that the contract with Bruce Peebles & Co., Ltd., for the supply of two motor converters for the Tavistock Street sub-station be entered into forthwith at the revised price of £5,100 per set; and that sanction be given to the purchase of an additional motor converter set from Messrs. Bruce Peebles & Co., Ltd., at £5,100.
L.C.C. Highways Committee. Reinforced concrete to cover the inner surface of coal bunkers at Greenwich power station :—

D. G. Somerville & Co., Ltd. (accepted)	**£1,893**
L. H. & R. Roberts	1,989
P. Lind & Co.	2,320

Portsmouth.—Town Council. Accepted:—
Boiler and bunker (£8,235).—Babcock & Wilcox, Ltd.
Turbine, alternator, and condensing plant (£14,933).—Fraser and Chalmers, Ltd.

Sunderland.—Town Council. Accepted:—
Cable.—British Insulated & Helsby Cables, Ltd.
A.c. meters.—Metropolitan-Vickers Electrical Co., Ltd.

Torquay.—Town Council. Accepted:—
Switchgear for Newton Abbot power station and main sub-station at Torquay (£6,420); special system of feeder protection (£135); neutral earthing gear and resistance for main power station (£232).—British Thomson-Houston Co., Ltd.
Turbine rotary pump (£305) and extras (£72).—J. & G. Weir, Ltd.

FORTHCOMING EVENTS.

Salford Technical and Engineering Association.—Tuesday, December 26th. At the Royal Technical College. 6.15 p.m. to 1 a.m. Annual social.

Royal Institution of Great Britain.—JUVENILE CHRISTMAS LECTURES.—"Six Steps up the Ladder to the Stars," by Prof. H. H. Turner, F.R.S. At 3 p.m., Thursday, December 28th. The Distance of the Stars (I). Saturday, December 30th. The Discovery of the Planet Neptune (II).

Junior Institution of Engineers.—Friday, December 29th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "Brewery Engineering," by Mr. C. F. Morgan.

NOTES.

Diesel Engine Pyrometers.—In the course of a paper on the running conditions and operating symptoms of marine Diesel engines, which Mr. A. J. Brown read before members of the Institute of Marine Engineers (Inc.) on December 5th, it was pointed out that pyrometers are invaluable for denoting the condition of the exhaust valves, if used in conjunction with indicator cards, while the balance of the engine can be approximated also by their use, provided the condition of the valves is known. They consist of thermo-couples placed as close as possible to the exhaust valves in each cylinder, while the wires are led into a switch and the readings are taken from a common dial. If the exhaust temperature of any one cylinder was observed to be lower than normal, it would probably be found that the cylinder was low in output due to fuel admission, or loss of compression due to piston rings, or sources other than the exhaust valve. If the temperature were above normal, then the cylinder would be overloaded, or fuel injection be late, or else the exhaust valve would be leaking. With a leaking exhaust valve a higher pyrometer temperature would be recorded, even though the fuel distribution to that cylinder was less than its neighbours, due to the escape of gases right through the firing stroke. Therefore, if all valves, piston rings, and cylinder joints were known to be tight, uneven pyrometer readings would draw attention to fuel injection and load balancing conditions.

Welfare Work at Ferranti's.—Messrs. Ferranti, Ltd., Hollinwood, have just completed a recent improvement in their Women's Dining Room, where a new maple floor has been laid. This now makes it possible to utilise the room for social functions. The first such event took place on Tuesday evening last week, when a successful dance was held for employés and their friends. A representative gathering from all departments attended. The room was artistically decorated by Mr. H. Sampson and his staff of the building department, and the lighting effects were arranged by Mr. E. Morris of the plant department. This work was almost entirely carried out by voluntary effort. Mr. H. Sampson and Mr. Hilton Taylor proved themselves efficient M.C.'s, and the Lisle Jazz Band rendered lively and inspiring music. The following evening an exhibition of handicraft was held in the same room, when work of all descriptions done by the employés was exhibited. Prizes were awarded for the best work done in each grade. Other attractions included a Japanese tea garden, and various amusing competitions. In this same room a stage has been fitted up out of the proceeds of dinner-time concerts, and operatic and dramatic events have already taken place. On January 19th, 20th, 22nd, and 23rd, the Ferranti Operatic Society is giving performances of the "Pirates of Penzance," when successful evenings are anticipated.

X-Ray Martyrs.—The Carnegie Foundation has presented gold medals to M. Bergonie, of Bordeaux, and Dr. Vaillant, research workers, for their devotion to their labours. M. Vaillant has been given a further grant of 50,000 francs. Dr. Vaillant, of the Lariboisière Hospital, Paris, is one of the best-known of French radiologists. Owing to the harmful effects of X-rays, he had to have his left arm amputated in September, 1917, and since then he has undergone no fewer than 12 operations, the last early this month, when his right hand was amputated.—*Daily News.*
A movement is on foot to bestow a pension on Dr. Vaillant by the Municipal Council that will enable him to spend the rest of his days at least in freedom from material want. Dr. Vaillant is shortly to receive a gold medal from the French Poor Law Department.—*Morning Post.*

Relief of Russian Engineers.—We have received a copy of an appeal which is being circulated by the Engineers' Section Sub-Committee of the Committee for the Relief of Russian Intellectuals, of which section Sir Robert Hadfield, Bart., is hon. president. The appeal reveals the reduced state to which Russian engineers have been brought by the famine and stagnation of industry. Donations should be made payable and sent direct to the hon. treasurer, Mr. R. C. Griffith, 8, Victoria Avenue, Bishopsgate, E.C.2.

Ontario Peat Deposits.—The Ontario and Dominion Governments' Committee of Experts, reporting, after an investigation lasting seven years, that Ontario peat can be manufactured in commercial quantities in competition with anthracite, recommends the Governments to undertake the construction and operation of a peat-producing plant near Alfred, Ontario. A good market has already developed for the product, which the Committee thinks should retail large quantities at $10 (£2) a ton.—*The Times.*

The Electric Vehicle Committee.—The Electric Vehicle Committee of Great Britain held a meeting at the Institution of Electrical Engineers on November 16th. Mr. J. A. Priestley (Cleansing Superintendent to the Sheffield Corporation) presided, and a discussion took place on the position of the electrically-propelled vehicle in relation to the proposed changes in motor taxation. A Sub-Committee of the Electric Vehicle Committee was appointed to deal with this important matter, in close association with the Electric Vehicle Section of the Society of Motor Manufacturers and Traders, and will consider both the interpretation of the present Act and the future policy which should be adopted.

The hon. secretary reported that a satisfactory response had been received to the advertisements announcing a poster competition in connection with electric vehicles. The Incorporated Municipal Electrical Association is to be asked to publish, through its medium of communication with members, an appeal to all municipal electrical engineers and members of electricity committees to assist the propaganda work of the Electric Vehicle Committee and to take steps to secure all the benefits of the electric vehicle load.—*Electric Vehicle.*

London Transport Organisation.—Sir Henry Maybury, Director-General of Roads, Ministry of Transport, giving evidence recently before the Royal Commission on London Government, said that during the last two years the traffic situation of London had very much improved. More omnibuses, additional trains and tramcars had greatly relieved the congestion existing just after the Armistice. The improvement had caused him to modify his view of the recommendations of the Kennedy Jones Advisory Committee on London Traffic, whose report he had signed. He saw difficulty in financing such a Board as was contemplated by that Committee. He recommended the appointment of a London Traffic Committee of not more than fifteen members, to advise and assist the Ministry of Transport or any Department which took over its duties. The traffic area dealt with should be that within a radius of twenty-five miles from Charing Cross. He recognised that if some comprehensive authority were in future set up for Greater London the powers of the suggested Committee might have to be merged in the general powers of the greater authority.—*The Times.*

Longer Tube Trains.—Seven-car trains are now running on the Central London Railway between Ealing Broadway and Liverpool Street during the rush hours. The record number on the tubes has been six-car trains hitherto, apart from the District Railway. Each car seats 48 passengers, and there is, therefore, total seating accommodation for 336 passengers in the new trains. Since the Central London Railway extension between Wood Lane and Ealing Broadway was opened in August, 1920, the traffic from West London to the City has increased from month to month; the big London shopping centres also being linked up with West London, a daily shopping traffic has developed, and thus increased accommodation has had to be provided. More six-car trains of the latest type were placed in service on the Piccadilly line towards the end of November. The principal feature of the new cars is an improved arrangement of doors. The old type Piccadilly car had but two doorways, one at each end. These end doorways are retained in the new cars, but there is also a 5 ft. 6 in. door in the centre, which overcomes one great difficulty, for whereas passengers were formerly reluctant to pass down the car if they were only travelling a short distance, they do not mind doing so in the new cars, as there is a "way out" in the centre. The centre doors are operated pneumatically, and not until the last door is closed does the motorman receive the signal to start the train. The signal is given automatically by an indicator electrically connected throughout the whole of the doors on each side of the train. The circuit of this indicator is broken unless every door is closed. Tests have been taken of the time of arrival and departure of these new trains at busy stations, and it is found that the "stops" have been reduced from 35 to 25 seconds. Congestion on both trains and platforms is thereby considerably reduced. The new Underground rolling stock now being constructed will be provided with the same system of doorways as that described above, and further improvements in connection with the seating, lighting, and decoration of the cars will also be incorporated with a view to making them as bright and comfortable as possible.

The Electrical Engineer and the Metallurgist.—At the annual dinner of the Birmingham Metallurgical Society on December 9th, Mr. F. C. A. H. Lantsberry, replying to the toast of "The Metallurgical Industry," said that those who practised in the metallurgical industry followed at one and the same time an art and a science. Industry would have to recognise that the technical man must take a more active part in the control of industry.

Prof. W. Cramp, chairman South Midland Centre, Institution of Electrical Engineers, urged the desirability of metallurgists getting into closer touch with similar technical associations. There was common ground existing between metallurgists and electrical engineers, as, for instance, in electric furnaces for iron and steel and the non-ferrous metals, and co-operation was also desirable in such matters as magnet steels. Neither the electrical engineer nor the metallurgist could develop the art to its fullest extent; it must be worked out by a combination of the two.

Lectures.—On December 7th, Capt. P. P. Eckersley gave a lecture to the Chelmsford Engineering Society on "Wireless and Aircraft." The President, Capt. H. Riall Sankey, C.B., occupied the chair.

The lecturer started by emphasising the importance of communication between aircraft and the ground and also between different machines. Many collisions in the air might have been avoided if pilots had been able to communicate with each other and fix their courses accordingly. The pilot of a machine lost in a fog can find out his position by wireless. It has been necessary to design a special microphone which is only actuated by a strong impulse. The noise of the machine does not affect it, but when placed close to the mouth it works successfully. A great difficulty previously met with has now been overcome by screening the magneto and sparking plugs. Capt. Eckersley explained clearly the working of the thermionic valve and other parts of the wireless sets used in aircraft.

Energy.—Old lady (who has been watching with growing interest the gesticulations of two Fascisti conversing unrestrainedly at Victoria Station): "I've often wondered what this conversation of energy was that they talk such a lot about, but it's really quite simple, after all!"—*Morning Post.*

Electrical Power Engineers' Association.—On January 5th Mr. J. H. Pane, B.Sc., will deliver a lecture before the Association (at the Institution of Electrical Engineers) on "Water and its Action on Steam Boilers." Mr. W. J. Oswald, A.M.I.E.E., will take the chair at 7 p.m.

The International Conference on High-Pressure Transmission.—The report of the proceedings at the Conference which was held at Paris in November last year—a volume of 1,200 pages, with 350 illustrations—is now ready, and is being issued to subscribers by the Union des Syndicats de l'Electricité, 25, Boulevard Malesherbes, Paris (price 100 fr.). Only 150 copies will be available after the subscribers have been supplied, and the work will not be reprinted; those who wish to have copies should therefore lose no time in sending their orders to the Union.

The work includes a statement of the object of the Conference, a general report by M. Boucherot, the full text of the 68 reports that were submitted, and a verbatim report of the discussions (revised by the speakers—this is the cause of the delay in publication). The Report thus contains not only practical information regarding all that has been done throughout the world in connection with electric transmission at very high pressures, but also the personal views of the most competent engineers on the systems dealt with, and should prove invaluable to those engaged in similar work.

Radio Acoustics.—The acoustic properties of radio transmitting rooms have been the subject of investigation at the Birmingham station of the British Broadcasting Co. It has been found essential to arrange the room so that all the usual echo effects shall be eliminated, for these are incorporated and often magnified in the transmission of music. The desired conditions have been achieved by hanging the walls with heavy drapery, which has little or no reflective effect upon sound waves. The exact amount of draping used had to be determined by experiment, for it became apparent that if too much were provided the clarity of some kinds of music was damped to quite an appreciable extent—which was, of course, noticeable at the receiving end. The floor also it was found best to cover with thick carpet. The room itself is situated in the quietest part of the building, well away from the transmitting plant, so that parasitic noises are not introduced. Only the actual rendering of the programme is done in this room, and a separate lounge is provided for the artistes who, for the time being, are not engaged. The operator finds it a necessary preliminary generally to instruct the artiste on the correct use of the microphone. Some artistes naturally feel a strangeness when singing or speaking into it, and their proximity and the direction in which the voice is thrown enter largely into the success of the transmission. If the singer is too near, breathing between the pauses is plainly audible to listeners in. Usually a distance of between two and three feet from the microphone gives best results where vocal items are concerned, but in instrumental and orchestral selections the right proximity is a much more complicated question, and can only be determined by experiment.

Electricity in Steelworks.—Mr. C. T. S. Arnett read a paper at the annual meeting of the Middlesbrough and District Association of Foremen, Engineers, and Chief Draughtsmen on December 9th on "Electricity as applied to steelworks." He dealt with turbo-generators and boilers, switchgears, starters, and regulators, and made some interesting observations on crane electrical equipment and underground cables. He emphasised the need for electrical equipment of the very best quality and workmanship, since any defect, however, small, soon developed into a serious breakdown. He urged manufacturers and engineers in charge to pay more attention to details, and gave an instance in which a few shillings expended by the makers would have saved hundreds of pounds. Manufacturers must study and send their designers to study the local conditions and steelworks, and then they would get better electrical gear and stop spending money on extravagantly-designed motors.

The Radio Arc v. Valve.—Under the auspices of the South African Institute of Electrical Engineers, Mr. C. F. Elwell (managing director of the Messrs. C. F. Elwell, Ltd.) delivered an instructive lecture on "The Poulsen Arc System, as Applied to Long-distance Communication," at Johannesburg in July last, in the course of which the *Transactions* of the Institute report him as having said, *inter alia*: It has been calculated that over 20,000 kW of arc transmitters are in use to-day, and although many, with something else to sell, predict the death knell of the arc, it is very probable that it will be many years before the last arc generator will have been definitely scrapped in favour of another cheaper and less costly to maintain. It is the one good system which is not covered by a mass of patents which are employed, as a rule, to dictate the terms and conditions under which it may be used. Practically all other radio systems capable of being employed in high power stations are in the hands of the wireless combination of English-American-French and German companies. Such being the case, even though something quite superior should be developed, and experience has shown how long it can take for these developments to take place, it is quite likely that the arc generator, which can accomplish very useful results, and be obtained for a reasonable price, will still hold a large part of the field.

In reply to various questions put to him the lecturer said: I would not think of making arcs of much less than 5 kW. Up to 10 or 20 kilowatts the valve is a beautiful instrument. The tendency seems to be to think that because it is so supreme in the lower end of the field it will be also supreme at the other end.

The question of economics is simply this: With the arc you have to pay for the power, and renewing the copper tips and carbons is a very small matter. For even a large station like that at Rome the consumption of electrodes would be easily covered by about £100 per year. For generating the same amount of power in the aerial with large silica valves, supposing we want to put 100 kilowatts in the aerial, we will take 20 costing £60 apiece. Though we can take valves back, put in a new filament and clean them, it still costs in the neighbourhood of £30 apiece. One of these lasts, if one likes to be an optimist, somewhere round about a thousand hours. If a station were to run 4,000 hours per annum, you would have to have at least four renewals and, as I spoke of 20 valves, that would be 80 renewals at £30 apiece. So there is considerable money involved in renewals. Another point is that if an arc system exists and is working, a valve set though possibly cheaper, has still got to prove that it will save money. If it costs more to operate, you will refuse to have it.

As a manufacturer of valves, I cannot see a tremendous reduction in the price of valves coming just yet.

The reason why the Imperial Government adopted arc stations in out-of-the-way places like Nairobi, Singapore, and Hong-Kong was on account of the shipment of valves; they are very fragile; you have to have a large stock of them. A valve is easy to control; but there is no difficulty in getting an arc to work up to speeds of from 75 to 100 words a minute. The larger it is, of course, the slower it is to key. A key was tested at 133 words a minute, and it has been used at 60 or 70 words a minute at Leafield. There is not yet traffic enough to warrant the use of that high speed.

With valves which last 5,000 hours I am quite familiar for reception work, and it is quite possible that valves with a 5,000-hour life will come along soon for transmission. The efficiency of the arc is about 50 per cent. One type of valve has an efficiency of 66 per cent.; another 80 per cent. The question is: shall we get such efficiencies when we link up large numbers of valves as it is proposed to do?

The most valuable thing in connection with the Alexanderson system is not the alternator, but the Alexanderson multiple aerial. The day will come when the last word will be a rotary machine in a power house. I have seen recently, alternators of quite modern frequency, not "doublers or triplers," but multipliers of 13, 15 and 17. This system is thought a lot of by its originators. They have already built a 500-kilowatt machine and it stands a better chance than the arc or the valve, if it can be built cheaply enough; the Alexanderson alternator is expensive and not as simple as it looks.

Exide Battery Service.—We understand that a Buick motor-car is being used for a honeymoon tour round the world by Mr. and Mrs. R. J. Jefferies. The tour commenced June 10th last and travelling from Ohio to New York, the couple sailed for London; crossing to the Continent, they motored through Belgium, Germany, Austria, Bavaria, Switzerland, and France, returning from there to London. They have since carried out a circular tour of Great Britain, travelling by the East Coast to John o' Groats and down the West Coast to Land's End. They have now returned to London, having so far been in nine countries and covered over 11,000 miles.

Leaving London early in the New Year, they will travel through France, Italy, and Northern Africa to Palestine, thence proceeding to the Far East and *via* Australia back to the States.

The particular interest of this tour lies in the fact that such an undertaking demonstrates the thorough reliability of the modern car for such strenuous service and that an Exide battery is carried on the car for starting, lighting, and ignition, and whatever country the car can penetrate, there is an Exide battery service depôt to look after the battery.

Fans in Winter.—A correspondent of the *Electrical News* (Toronto) points out that the use of electric fans need not be confined to hot weather. The temperature of an artificially-heated room varies considerably at different levels, ranging under ordinary conditions from 58 deg. F. at floor level to 80 deg. at the ceiling. Actual trials made by the writer have shown that a 9-in electric fan (pointed at an angle towards the ceiling, so that no draught will be felt) will so circulate the air that the temperature of all parts of the room will be more or less equalised, giving a much more comfortable atmosphere. It is considered that a saving might be effected in the heating arrangements, which would compensate for the cost of the fan.

The Sperry Gyro Compass.—A paper on this subject was read by Mr. H. M'Comb before the Greenock Association of Electrical Engineers on November 29th. The lecturer clearly expounded the theory, and described the components of this type of compass. Precessional effects were demonstrated by spinning tops and gyroscopes.

The Electrical Trades Benevolent Institution.—N.E. Coast Section.—On Friday last a ball, organised by the Newcastle and District Advisory Committee of the E.T.B.I., was held at the Heaton Assembly Rooms, Newcastle-on-Tyne. The guests were received by Mr. H. W. Clothier, chairman, and Mrs. Clothier, and numbered 250. The committee in charge of the arrangements comprised, in addition to Mr. Clothier, Messrs. J. Gledson (treasurer), Anns, Wardroper, Spence, Robson, and Fletcher.

As in previous years, special attention was paid to the producing of remarkable lighting effects. On this occasion the decorations were exceedingly good, having been carried out by Mr. W. Fletcher, of Messrs. Fletcher Bros., and Mr. A. S. Lowrey, of Messrs. Robson and Coleman. Various firms lent the necessary lamps, &c. A Christmas tree, brilliantly lighted, was presented by Mr. Beck, of the British Thomson-Houston Co., and the presents on the tree, which were given by lady supporters of the Institution, were sold by auction in the course of the evening. The proceeds of the sale amounted to about £40.

It is anticipated that the Institution will benefit very materially, as the result of efforts of the energetic committee; Mr. Fletcher acted as dance secretary, and was untiring in his efforts to ensure the success of the ball, the fourth which has been held.

The General Electric Co., Ltd., and the British Thomson-Houston Co., Ltd., lent a large number of shades, lamps and projectors; and Messrs. Fletcher Bros., Robson & Coleman. Falconar Cross & Co., R. W. Cairns, and T. G. Usher & Co. gave the services of their workmen to carry out the work. Mr. W. Anns presented an electric kettle and a quantity of golf balls.

It is obvious that similar functions could be organised elsewhere, and we hope that the excellent example given by Newcastle (and Cardiff and Manchester, which are also active supporters of benevolence) will be followed in many other industrial centres.

Appointment Vacant.—Engineer (design) (£300+) for the Admiralty Mining Department, Portsmouth. (See "Official Notices" to-day.)

INSTITUTION NOTES.

Institution of Electrical Engineers. — Liverpool Sub-Centre.—Mr. W. A. Gillott read his paper on "Domestic Load Building" before the Sub-Centre on December 11th. The discussion which followed was interesting and lengthy, the following taking part:—Messrs. Dickinson, Nelson, Britton, Waygood, Moxon, Wilson, Watson, Tavernor, and Lang. Before the reading of the paper, the president, Mr. F. Gill, addressed the meeting on Institution matters. Mr. Welbourn reminded the meeting that it was not generally known that Mr. Gill's colleague, Dr. Jewett, was the president for this year of the American Institution, which Mr. Welbourn thought was a rather remarkable coincidence.

North-Eastern Territorial Centre.—*Students' Section.*—At a meeting of the Section, held on December 15th, Mr. J. Piquet (student) read a paper on "Automatic Control Equipment used in D.C. Traction." Mr. W. N. Kilner was in the chair, and six members took part in the discussion which followed. The next meeting will be held on January 12th, when Mr. J. Bell (student) will give his paper on "The Effect of Reactance on the Design and Performance of Electrical Machines."

Junior Institution of Engineers.—In his presidential address, on December 12th, Capt. H. Riall Sankey spoke upon the utility of theory to the practical man, illustrating his statements with concrete examples of the application of formulæ and first principles to engineering undertakings of many kinds. When theory and practice did not agree it was only because either sound theory was misapplied, or the theory was insufficient or visionary.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Mr. F. T. Homan, A.M.I.E.E., chief assistant at the Northampton Electric Light and Power Co., Ltd., has received several handsome presents upon his leaving the company after 17 years' service to take up an appointment in Calcutta. The presents included a clock and a cheque from the directors, a silver entrée dish from the general manager (Mr. G. H. Jackson), and a fitted dressing case, together with a gold wristlet watch for Mrs. Homan, from the staff and employés.

Mr. Alderman H. Brown, vice-chairman of the Leeds Tramways Committee, has been appointed chairman of the National Joint Industrial Council for the Tramway Industry for the ensuing year.

Owing to his Parliamentary duties, Coun. R. J. Wilson, the new Labour M.P. for Jarrow, has resigned his position as chairman of Sunderland Corporation Electricity Committee. The vice-chairman, Coun. T. Speeding, has been elected chairman, and Ald. T. Harrison vice-chairman.

The Nobel Prizes were handed to some of the winners by the King of Sweden at Stockholm on December 10th. Prof. Bohr, of Copenhagen, was the winner of the prize for physics (1922); Prof. Frederick Soddy, of Oxford, the winner of the chemistry prize (1921); and Prof. Francis Aston, of Cambridge, the winner of the prize for chemistry (1922). Prof. Einstein (physics, 1921) was not present, but was represented by the German Minister.

Obituary.—Mr. A. R. McCallum.—In our last issue we were only able to report briefly the death of Mr. Alexander Rodger McCallum, B.Sc., A.C.G.I., as the full particulars were not in our possession at the time of going to press. Mr. McCallum was alive and well on Monday morning, December 11th, and he proceeded from his residence at Ealing to visit several towns in the provinces in connection with work upon which his firm, Messrs. C. P. Sandberg, consulting and inspecting engineers, of Westminster, were engaged. In the afternoon of that day he was at Leeds in touch with the London Office by telephone and was in conference with his firm's representatives in Leeds, and all was then well. He subsequently proceeded by express train intending to make Sheffield his destination for the night in readiness for the work of the morrow. According to the evidence produced at the inquest, which was held on the following Wednesday in Chesterfield, his ticket had been given up at Cudworth, some 30 minutes from Sheffield, and apparently he had then fallen asleep. Always a heavy sleeper he passed, the only occupant of the compartment, beyond his destination, since he was seen by the guard of the train asleep at Dore and Totley station, and when the train reached Chesterfield, the compartment door was found open and the carriage empty. A search party found his body on the line a short distance away. As far as can be known, he had, in a state of semi-consciousness, opened the wrong door in haste to ascertain his whereabouts, and instead of stepping into the corridor, as intended, had fallen on to the line. The jury at the inquest brought in a verdict of "Accidental death."

It may be remembered by some of our readers that Mr. McCallum (who was 36 years of age), was for many years in the service of the London Electric Railway Company. In 1921, he left that company to take up an appointment on the staff of Messrs. C. P. Sandberg. He had had a wide experience in connection with electric traction. Serving a pupilage at Messrs. Dick, Kerr & Co.'s Preston Works, he joined the London United Tramways in 1908, and later took a post on the staff of the London Underground Group, becoming, in March, 1915, chief assistant to the mechanical engineer. In this capacity he had charge of all rolling stock, workshops, and running repairs to trains, gaining unique experience in these matters. In the autumn of 1919, in company with three other officials, he visited the United States to make a study of electric traction conditions in that country.

In the year-and-a-half that Mr. McCallum had been on Messrs. Sandberg's staff, his work has been most successful and his services had proved invaluable. His duties generally consisted in dealing with the mechanical side of the various problems arising in connection with the firm's general business, and he dealt also, more especially, with the design and erection of plants for the treatment of tires by the Sandberg Sorbitic Process at various works throughout the country.

The death of Mr. McCallum came to his relatives, also to ourselves and his many electrical and mechanical engineering friends, as a terrible shock; he was a man of lovable disposition, and highly esteemed by everybody who knew him. We believe we shall be expressing the sentiments of quite a large number of our readers, when we tender to his widow, who is the elder daughter of the late Mr. T. E. Gatehouse, and is left with two young children, and to his father (a well-known contemporary in London and Scottish journalism) our most sincere sympathy in their bereavement.

A memorial service was held at Christ Church, Ealing, on Monday last, and the burial took place at Brookwood Cemetery. Among the floral tributes, which were very numerous, was a lorry load of affectionate tokens of remembrance from the staff and employés of the London Underground Railways, with whom, as mentioned, he had been in close association for so many years.

Herr P. Berthold.—The death is announced from Berlin, at the age of 57 years, of Herr P. Berthold, a director of the Bergmann Electricitatswerke Gesellschaft, of Berlin. He had been associated with the concern since 1899.

NEW COMPANIES REGISTERED.

Radio Recorders, Ltd. (186,375).—Private company. Registered December 13th. Capital, £6,000 in £1 shares. To adopt an agreement with F. Clutsham to develop the business of sound recording referred to therein, and to carry on the business of gramophone and phonograph manufacturers, manufacturers of discs, records, accessories, and fittings, importers and exporters of all kinds of gramophone and phonograph instruments and accessories, &c. The permanent directors are:—F. Clutsam, Ruskin Manor, Denmark Hill, S.E.; P. T. Perrins, 37, Leinster Gardens, W. Qualification, £25. Remuneration as fixed by the company. Registered office, 66, Victoria Street, S.W.

Ferryside Electric Supply Co., Ltd. (186,406).—Private company. Registered December 14th. Capital, £1,200 in £1 shares. To carry on the business indicated by the title. The permanent directors are: A. H. Stoodley, 5, Priory Street, Carmarthen; S. W. Thomas, Delphi, South Parade, Tenby. Qualification: £50. Manager: A. H. Stoodley. Registered office: 5, Priory Street, Carmarthen.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Snowdon Mountain Tramroad and Hotels Co., Ltd.—Satisfaction in full on November 14th, 1922, of debenture dated July 10th, 1895, securing £100.

T. F. Collier & Co., Ltd. — Particulars filed of £1,000 debentures, authorised November 22nd, 1922, charged on the company's undertaking and property, present and future, including uncalled capital; the amount of the present issue being £700.

Jones & Pordes, Ltd.—F. T. Shearcroft, of 22, Newgate Street, E.C., was appointed receiver and manager by Order of Court dated December 2nd, 1922.

H. Stanley Prince, Ltd.—Particulars filed of £500 debentures authorised December 7th, 1922, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

Yorkshire and District Electric Lamp Repairing Co., Ltd.—Two debentures dated November 29th and 30th, 1922, to secure (1) £600, and (2) all moneys not exceeding £2,000 which the mortgagees may pay under their guarantee to the company's bankers, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: H J. M. Cockayne, Sheffield, and others.

East Anglian Electricity, Ltd.—Mortgage dated November 30th, 1922, to secure £3,000. Charged on the company's undertaking and property, present and future. Holders: L. H. Vulliamy and G. B. Steward, 17, Arcade Street, Ipswich.

Holmes and James, Ltd.—Particulars filed of £4,000 debentures authorised November 29th, 1922, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

Walker, Macewen & Co., Ltd.—Particulars filed of £950 debentures authorised November 24th, 1922, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Newcastle and District Electric Lighting Co., Ltd.—Particulars filed of £100,000, third mortgage debentures authorised November 15th and covered by trust deed dated December 6th, 1922, charged on the company's general assets, subject to prior deeds and debentures, the whole amount being now issued. Trustees: V. Thompson and W. Reay-Smith.

Omega Lampworks, Ltd.—Particulars filed of £2,000 debentures authorised November 25th, 1922, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,500.

CITY NOTES.

Ferranti, Ltd. Mr. A. W. Tait, C.B.E., presided on December 14th at the annual general meeting. In moving the adoption of the report, he said that the net profit for the year amounted to £24,371, as against £36,268 in the previous 12 months. The falling off in profit was accounted for by the acute depression in trading which had existed during the period covered by the accounts, and in their last report the board had informed the shareholders that there had been a serious diminution of orders from the beginning of 1921, which would materially affect the results of the next financial year. That in itself would be sufficient to account for the lower net profit, but the position was also aggravated by the dispute in the engineering trade in the spring of this year, which seriously curtailed output, particularly in the meter department. In consequence of the depression and the curtailment of output, the output of the year under review was only 60 per cent. of that of the previous year, which was the highest output ever attained by the company in the matter of its general products, apart from the production of war material, which was, of course, entirely abnormal. In con-

sequence of the drop in output, the trading profit fell from £141,175 to £90,313, but against that they had been able to make certain reductions in general establishment charges, and there was a reduction in the amount required to be set aside for taxation, so that this item which amounted to £81,382 in 1921 had fallen to £46,945. Repairs and renewals amounted to £3,794, as against £5,271 in the previous year. During the war period the works were considerably enlarged and extended, and following that period they were reorganised in order to provide facilities for dealing with the large output in the three departments upon which the energies of the company were now concentrated. With regard to meters, which was the largest department of the company's business, they were now organised to deal with a very substantial output. The manufactures of the company were finding general acceptance both at home and abroad, and the new a.c. meter which was produced for the export trade had now a ready and substantial sale. They were at present at work upon a new type of d.c. meter, which they hoped to place on the market at an early date. With regard to transformers, they had been busily engaged in standardising types in order to extend the business in a satisfactory manner. They had also entered the extra-high-pressure field, having recently shipped certain transformers to New Zealand for raising a pressure of 10,000 V to 110,000 V. They believed there was considerable scope for this department not only in the general development of electricity both at home and abroad, but particularly in connection with the numerous railway electrification schemes which were under consideration, some of which must be proceeded with in the very near future. The results of the instrument department for the year were disappointing, but steps had been taken to overhaul the organisation; this, it was hoped, would lead to better results. The financial position of the company had materially improved in the year. With regard to the assets, leasehold land and buildings at £85,108 were at the same figure as in the previous year. Plant, machinery and tools stood at £166,974, or an increase of £4,851, as compared with the previous year. Goodwill and patent rights at £1, and investments at £18,937, were the same as in the previous year. Stocks and stores, and expenditure on work in progress, at £156,527, represented a decrease of £50,881. This decrease was accounted for not only by an actual reduction in quantity but also by a considerable reduction in values due to the fall in prices. Cash at bank and in hand at £41,646, represented an increase of £25,492 on the previous year. On the liabilities side of the account, the share capital remained the same. First mortgage debenture stock showed a reduction of £4,000, and the five-year notes which, at June 30th, 1921, stood at £32,200, had been paid off to the extent of £27,700, and the outstanding balance would be repaid at the end of this month. The loan from bankers against security, which amounted to £2,716, had also been paid off in the year, and the security which represented £30,000 second debentures of the company, had been handed back and cancelled. Trade creditors at £106,088, represented a reduction of approximately £96,000 on the previous year, which was very satisfactory. With regard to the depreciation reserve account, the sum of £50,000 had been transferred from that account to the general reserve account, leaving a balance of £56,912. The general reserve account, after making that transfer, stood at £152,630. The reduction which had been made in the secured and unsecured liabilities had been very substantial, and the company was now in an excellent position and credit. He did not propose to make any forecast with regard to the current financial year. He would say, however, that the orders which had been received during the last six months were encouraging, and, as there seemed to be indications of a slow but gradual improvement in trade, there was every reason to believe that they would get their fair share. In consequence, they were hopeful of being able to submit a satisfactory account of their operations for the year to June 30th, 1923, unless something unforeseen occurred.—Dr. S. Z. Ferranti seconded the motion, which was carried unanimously.—Subsequently an extraordinary general meeting was held when resolutions were agreed to sanctioning a scheme for the rearrangement of the company's capital, which had been framed in order to deal with the arrears of dividend on the 6 per cent. cumulative preference shares, to provide a share bonus to the ordinary shareholders to compensate, in some measure, for the absence of dividends and to increase the deferred shares to an amount more commensurate with the value of their interest in the company.

The chairman explained the scheme, which was set forth fully in our "City Notes" last week, and the proposed arrangements were approved subject to the sanction of the Court.

Fuller's United Electric Works, Ltd.

The directors state that the accounts for the year ended March 31st, 1922, cannot at present be presented, in view of the scheme of reconstruction, which has already been approved by all classes concerned, and which is now awaiting the formal approval of the High Court. As soon as possible accounts, showing the position after reorganisation is completed, will be submitted. Meanwhile the company's business shows steady improvement, and with the support of shareholders and noteholders, as provided under the scheme, it is considered that the future prosperity of the company is assured.—*Financial Times.*

Barbados Electric Supply Corporation, Ltd.

The trading profit for the year ended June, 1922, amounted to £5,686, as compared with £5,272 and £4,618 for the two previous years. After charging general expenditure in London, debenture and loan interest and a reserve for taxation, the amount remaining (including £1,084 brought forward) is £4,895; £2,000 of this has been transferred to depreciation reserve account, and £1,784 had been written off in respect of discount and expenses of issue of 6 per cent. debentures, leaving £1,022. £2,549 has been charged against trading for repairs and renewals, as compared with £1,481 in the previous year. The number of consumers increased during the year from 2,087 to 2,395, and the lamps connected from 25,796 to 29,524.

The capital expenditure during the year was £2,722, consisting of additions to plant and to house connections and mains. The issue of 5½ per cent. debentures matured on June 30th, 1922, and arrangements were completed for an issue of £25,000 6 per cent. debentures, of which £18,000 were taken up and £4,000 have been lodged as collateral security.

German Companies.

The directors of the *Insulated Wire Works Co.* (*Vogel*), of Berlin, recommend an increase in the rate of dividend from 35 per cent. in 1920-21 to 50 per cent. last year. It is proposed to increase the share capital from 104 to 208 millions of marks.

The *United Electro Works Co.*, of Saarbrucken, reports net profits of 1,541,000 marks in 1921-22, the first year of its activity. During the later months of the year the directors state that the company's manufactures experienced satisfactory sales, and success had attended the efforts to open up new markets, particularly abroad. A dividend at the rate of 20 per cent. has been declared on the ordinary shares and the future prospects are said to be favourable.

The report of the *Telephone Works Co.*, (late *Berliner*), of Hanover, states that supplies of raw materials were more easily obtainable in 1921-22, and the works were adequately occupied. After having made provision for depreciation, the accounts show net profits of 16,192,000 marks, as contrasted with 4,331,000 marks in 1920-21, and the dividend rises from 20 per cent. in the latter year to 35 per cent. for 1921-22. At the recent meeting it was decided to increase the share capital by 80 millions to 120,000,000 of marks.

The accounts of *Max Schorch & Co.*, of Rheydt, show net profits and balance forward amounting to 5,099,000 marks in 1921-22, as compared with 1,596,000 marks in the previous year. The rate of dividend, as stated in a former issue, is increased from 10 per cent. in 1920-21 to 25 per cent. last year. It was decided at the recent meeting to raise the share capital from 19½ millions of marks to 50 millions, and it was mentioned that considerable orders had been received through the company's connections with three industrial groups.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Auckland City Tramway Loan.—£127,200 5½ per cent. debentures of £100 each, Nos. 1,073 to 2,334 (with coupon due January 1st, 1923).

Ever Ready Co. (Great Britain).—7,000 ordinary shares of £1 each, fully paid, Nos. 442,001 to 449,000, and 1,000 7 per cent. cumulative participating preference shares of £1 each, fully paid, Nos. 133,644 to 134,643.

Applications have been made to the Committee to allow the following to be officially quoted in the list:—

Llanelly and District Electric Lighting and Traction Co.—135,000 ordinary shares of £1 each, fully paid, Nos. 1 to 60,000, 135,001 to 150,000, and 225,001 to 285,000; and £125,000 7½ per cent. debenture stock. (Special application.)

Venezuela Telephone and Electrical Appliances Co., Ltd.—Profit for the year ended June, 1922, £24,365. Dividend 8 per cent. on the cum. preference shares. Capital expenditure during the year was £19,958, and this expenditure makes it impossible for the directors to recommend a dividend on the ordinary shares. The increased telephone rates took effect from October 1st, 1920.

British Vacuum Cleaner and Engineering Co., Ltd.—Industrial depression and trading conditions during the past year are reflected in the adverse result reported by the directors. In view of the loss sustained they have transferred to profit and loss account £3,250 from reserve. The accounts show a loss of £7,196.

Eastern Telegraph Co., Ltd.—Dividend at the rate of 3½ per cent. per annum, less income tax, on the preference stock for the quarter ending December 31st, 1922, and the third quarterly interim dividend of 2½ per cent. on the ordinary stock, free of income tax.

Victoria Falls and Transvaal Power Co.—Six months' dividend at the rate of 6 per cent. per annum, less tax, on the preference shares.

Automatic Telephone Manufacturing Co., Ltd.—Dividend on the 6 per cent. preference shares for the half-year ending December 31st.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—Interim dividend for the three months ended September, 1922, of 5s. per share, payable free of income tax.

STOCKS AND SHARES.

Monday Evening.

The week before Christmas, and the week after, are invariably slack times so far as business is concerned in the Stock Exchange. In spite of what was said at the Bevan trial, a good deal of window-dressing goes on in various directions, window-dressing that does not necessarily mean selling stock in order to increase bank balances, but which sometimes takes the form of buying with a view to increasing the amount of securities held by a company that makes up its balance-sheet to the end of the year. The various political developments abroad are regarded as being more favourable than they were at the beginning of the month, and the less truculent attitude adopted by Turkey has enabled gilt-edged stocks to present a firm front.

The year is winding up favourably in most of the markets connected with electricity issues. Although the railway stocks are not quite at the top prices which they reached a week or two ago, there is noticeable strength in Metropolitans at a trifle under 60 and in Districts at 45¼. The Underground Electric Railways shares lean to the dull side, those of the £10 denomination going back to 2¼. For some reason or other, these are neglected at present, and there seem to be a fair number of shares on offer to meet the moderate amount of demand now current. Foreign tramway issues are good, with Mexico Tramway bonds in demand. As an interesting sidelight on the Mexican situation, it may be mentioned that the Mexican Railway Company issued its report the other day, showing that steady progress is being made on the line, and suggesting that conditions are becoming more settled in Mexico. Hope still pins its faith to the expectation of an agreement being reached between the United States and the Mexican Governments, whereby the objections to a loan from America to Mexico would be removed, and, in consequence, the flow of capital into the latter country encouraged. Were means found whereby fresh money could be provided for Mexican utility companies, it is likely that the immediate effect would be a general rise in the securities, though the Americans would doubtless impose onerous terms as a condition of subscribing to new bond issues.

Home electricity shares keep strong, with Westminsters better than they appear at 8 rather buyers. County of London ordinary has moved up to 30s. 6d. bid, and the new ordinaries spurted to 5s. 10½d. premium. This represents a handsome profit to the subscribers who took up the shares when they were issued last May at 22s. 6d., but the strength of the buying movement is so considerable as to cause shareholders to look for a better profit in the near future. The important announcement made by the Electricity Commissioners, as to an agreement between the various London companies and some of the principal provincial undertakings, confirms the faith felt in the industry by those who have been supporting it, not only lately, but during the thin times through which it passed during the war.

There are not many electricity supply shares on offer; Charing Cross ordinary at 8, City Lights at 44s. 6d., County ordinary at 31s., Westminsters at 8¼, and London Electrics at 3 are all that appear in the list of one of the well-known firms of Stock Exchange jobbers, as available in this department. A greater variety can be obtained in the preference list, and it may be of service to set out in detail what can be obtained, adding a few tramway and other investments, for purposes of comparison :—

Preference share.	Div.	Price.	Yield	Divs. usually paid.
Anglo-Arg. Tram. 1st £5 ...	5½	3 15/16	6 19 0	J. & J.
Calcutta Tramways £5 ...	5	3¾	6 13 6	J. & J.
Charing Cross City £5 ...	4½	4½	5 9 0	J. & D.
City of Lon. Elec. 2nd £1 ...	8	28/-	5 14 6	M. & S.
County of Lon. Elec. £1 ...	6	23/6	5 2 0	M. & S.
English Electric £1 ...	6	18/6	6 9 6	A. & O.
General Electric "A" £1 ...	6½	21/9	5 19 0	J. & D.
Do. "B" £1 ...	7½	21/9	6 18 0	J. & D.
Lancashire Elec. £1	7	24/6	5 14 0	J. & O.
Lon. Elec. Sup. Corp. £5 ...	6	5½	5 14 6	M. & S.
Newcastle-on-Ty. Elec. £1 ...	7	22/6	6 4 6	M. & S.
North Met. Elec. £1	6	21/6	5 11 6	A. & O.
Scottish Power £1	8	23/9	6 14 6	F. & A.
Westminster Elec. £5 ...	4½	4 7/16	5 1 0	J. & J.
Yorkshire Elec. Power £1 ...	6	21/6	5 11 6	F. & A.

Of the debenture stocks, £2,000 Anglo-Argentine 4½ per cent. debenture is offered at 80, paying £5 13s. 6d., and £5,000 of the company's 5 per cent. second debenture stock at 82 ex dividend, yielding £6 2s. per cent. Whitehall Electric 6 per cent. debenture at 88 pays 7 per cent. on the money taking redemption into account. South Wales Electric 5 per cent. debenture stock (irredeemable) at £71 gives £7 1s. Newcastle-on-Tyne 5 per cent. first debenture at 91 returns £5 6s. 6d. per cent., and Electric Supply Corporation 5 per cent. debenture stock at 91 affords 5½ per cent. outright, or £6 13s. per cent. allowing for redemption at 100 in 1929. There are others of similar character, but this gives a fair idea of the varying degrees of security and yield which can be obtained at the moment.

In the market for cable stocks and shares, Anglo-Americans continue to advance, a feature being the strength of the deferred stock, which has risen to 23¼, in consequence of the near approach of the full year's dividend payment in February. The Eastern Telegraph and Eastern Extension have declared their usual 2½ per cent. free-of-tax dividends, and the group shows no particular change. Marconis are better, the parent shares hardening to 2 3/16, while the debentures, now that the call is out of the way, have recovered to 3 premium.

British Columbia Electric deferred and 4½ per cent. debenture stocks have gone back a little. Mexicans are a trifle irregular; Mexico Tramways 6 per cent. bonds improved to 56½; Mexican Light Common shares fell back to 21½. Anglo-Argentine Tramways are unaffected by consideration of the scheme for dealing with arrears of dividend on the second preference. Part of the information was published well in advance of the official announcement. The seconds keep good at 4¼.

In the manufacturing group, the feature is the strength of Electric Supply Corporation ordinary shares, to which attention was drawn here last week, when it was noted that the price of the shares had come up from 14s. to 16s., and might quite possibly move up to the neighbourhood of a pound. The present price is 18s. Babcock & Wilcox have touched 72s., a price which induced a little selling, and the shares reverted to 70s. Metropolitan-Vickers remain good, in consequence of the expectation that the company will receive substantial orders out of the forthcoming activity in railway extensions. The rubber market presents a firm front, with rather more business doing in spite of the close advent of the Christmas holidays. Armstrongs and Vickers have joined in the rise which iron and steel shares have enjoyed by reason of the brightening trade prospects, prospects which were emphasised by the speech of Mr. Bonar Law, at the end of last week, when he spoke hopefully of the general outlook for trade.

SHARE LIST OF ELECTRICAL COMPANIES.

Home Electricity Companies.

	Dividend. 1920.	Dividend. 1921.	Price Dec. 18, 1922.	Rise or fall.	Yield p.c.
Brompton Ordinary	12	12	10½	—	£5 17 1
Charing Cross Ordinary... ...	8	9	7¾	—	5 16 2
do. do. do. 4½ Pref. ...	4½	4½	4⅞	+ 1/8	5 7 5
Chelsea	6	6	6¾	—	4 9 0
City of London	14	14	2⅛	+ 1/8	6 7 10
do. do. 6 per cent. Pref. ...	6	6	23/-	—	5 4 4
County of London	8	8	30/9	+ 9d.	5 4 1
do. do. 6 per cent. Pref. ...	6	6	1⅛	—	5 4 4
Kensington Ordinary	9	10	7⅛	—	6 7 0
London Electric	2½	4	2⅝	—	4 4 3
do. do. 6 per cent. Pref. ...	6	6	5⅛	—	5 17 1
Metropolitan	7	7	6½	—	5 7 8
do. 4½ per cent. Pref. ...	4½	4½	4⅛	—	5 9 1
St. James' and Pall Mall	12	12	9½	—	6 6 4
South London	7	7	4⅛	—	5 18 0
South Metropolitan Pref.	7	7	1⅛	—	5 18 0
Westminster Ordinary	10	10	7⅛	—	6 7 0

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	6	6	102½	+ ½	5 17 1
do. Def.	1½	34/6	23¾	+ ⅛	6 5 0
Chile Telephone	6	6	6½	—	4 16 0
Cuba Sub. Ord.	7	7	8	—	8 15 0
Eastern Extension	10	10	19½	—	5 4 0
Eastern Tel. Ord.	10	10	190	—	5 5 0
Globe Tel. and T. Ord.	10	10	19½	—	5 4 0
do. do. Pref.	6	6	11⅛	—	5 7 10
Great Northern Tel.	24	22	28½	—	7 13 0
Indo-European	10	10	35½	—	7 1 0
Marconi	25	15	2⅛	+ 1/16	6 17 0
Oriental Telephone Ord.	12	12	2⅛	—	*5 4 0
United R. Plate Tel.	8	8	7½	—	*5 6 8
West India and Panama	Nil	Nil	10/-	—	Nil
Western Telegraph	10	10	19xd	— ⅛	*5 5 3

Home Rails.

Central London Ord. Assented ...	4	4	67	—	5 19 5
Metropolitan	1½	2½	59½	—	3 15 8
do. District	Nil	1	45⅝	—	2 4 0
Underground Electric Ordinary ...	Nil	Nil	2¾	— ⅛	Nil
do. do. "A"	Nil	Nil	7/-	—	Nil
do. do. Income ...	2	4	87½	—	*4 11 5

Foreign Trams, &c.

Anglo-Arg. Trams. First Pref. ...	5½	12½	3¾	—	7 2 0
do. do. 2nd Pref.	Nil	5½	4⅜	—	5 19 0
do. do. 5 per cent. Deb....	5	5	80½	−1	6 2 8
Brazil Tractions	Nil	Nil	48	—	8 6 8
British Columbia Elec. Rly. Pce. ...	5	5	78½	—	6 7 5
do. do. Preferred ...	5	93/-	76½	—	*6 3 6
do. do. Deferred ...	3	124/-	87½	−1	*7 0 6
do. do. Deb.	4½	4½	78⅛	— ⅛	5 8 3
Mexico Tram. 5 per cent. Bonds ...	Nil	Nil	81½	—	6 2 8
do. 6 per cent. Bonds ...	Nil	Nil	56½	+1	Nil
Mexican Light Common	Nil	Nil	21½	−1	Nil
do. Pref.	Nil	Nil	51½	—	Nil
do. 1st Bonds.	Nil	5	67	—	7 8 2

Manufacturing Companies.

Babcock & Wilcox	15	16	3½	—	4 11 5
British Aluminium Ord.	10	5	16/3	—	6 8 1
British Insulated Ord.	15	15	2½	—	6 13 4
Callenders	15	15	2⅛	—	6 17 0
do. 6½ Pref.	6½	6½	1⅛	—	5 15 7
Crompton Ord.	10	5	15/-	—	6 13 4
Edison-Swan	10	Nil	2/6	—	Nil.
do. do. 5 per cent. Deb.	5	5	64	—	7 16 4
Electric Construction	10	10	1⅜	—	7 5 6
English Electric	8	5	15/9	—	6 7 0
do. do. Pref.	6	6	18/3	—	6 10 6
Gen. Elec. Pref.	6½	6½	21/0	—	5 19 6
do. Ord.	10	5	17/0	—	5 17 8
Henley	15	15	2⅜	—	6 11 3
do. 4½ Pref.	4½	4½	4⅛	—	5 2 10
India-Rubber	10	—	11/3	—	—
Met.-Vickers Pref.	8	8	2⅛	—	6 11 2
Siemens Ord.	10	10	1⅜	—	—
Telegraph Con.	20	20	25½	—	*4 11 6

* Dividends paid free of Income Tax.

THE LUBRICATION OF VERTICAL GAS ENGINES.

By M. S. MASON.

Gas engines of the vertical type can be classified under two headings:—

1. Tandem engines.
2. Ordinary multi-cylinder engines.

As this article is written from a central-station point of view, and not personally recommending engines of the tandem type (for reasons which I will not state here), for this purpose, I will confine myself to the lubrication of the ordinary multi-cylinder engine.

The proper lubrication of these engines plays a very important part in their success. Insufficient attention is usually shown in the choice of oils. A good many engineers seem to think that as long as oil of some kind is present, everything should be all right.

In the ordinary steam engine, bad oils only show themselves in wear and tear, and one or two other points which do not materially affect the running from day to day.

In the case of gas engines, the reverse is found. Engineers get constant troubles of one kind or another, but seldom look for the cause of them in the oil they are using. Price too often arises before other considerations. One of two systems is usually adopted in the lubrication of these engines:—

(a) *Forced lubrication of crank case and special lubrication for cylinders.*

(b) *Forced lubrication of crank case and splash lubrication of cylinders.*

Referring to (a), a gas engine crank case oil is used for the crank case, and pumps working on the same system as the ordinary steam engine supply oil to the bearings, &c. This oil is in most cases not of the highest grade in lubricating oils, in fact many engineers use too low a grade, much to the engine's detriment. One engineer who was always anxious to get something cheap bought a "very good oil for gas engine crank case use," with the result that a violent explosion shook the station and nearly wrecked the engine, the vapours from the "very good oil" having caused the explosion.

Still, in all cases the grade of this oil is not fit for cylinder lubrication. To prevent it reaching the cylinders, splash plates are fitted. This is one of the disadvantages of this system. The splash plates do not keep back all the splash, with the result that this "unsuitable" oil is worked up to the top of the cylinders, causing an accumulation of carbon and often pre-ignition through the flash and fire temperature being incorrect.

As regards the special lubricator, this is usually of the "plunger sight feed type." Of course, a gas engine cylinder oil is used in this, but I have found that by experimenting with oils above the average grade used, surprisingly better results can be obtained. I have seen cases where troubles like seizing, pre-ignition, and engines refusing to carry their rated loads have totally disappeared the class of oil was changed, using one that has been properly blended for the purpose. This lubricator is usually the cause of a lot of worry to the engineer-in-charge. Be as careful as he may, bits of foreign matter seem to get into the oil in one stage or another of its use, and these accumulate in the small ball valves in connection with the pump, the result being (if he cannot shut the engine down) he has to try to clean it while still full of oil so as to keep the other cylinders lubricated. From the lubricator the oil passes through piping to the cylinders.

The connection on the outside of the water jacket is usually made with a small non-return valve. Here again is a seat of trouble. Owing to the heat, the oil carbonises, with the result that the outlet to the cylinder or the valve itself gets choked up. The connection has to pass through the water jacket. This is a very serious disadvantage. Cases have been known where the connection has corroded away and water has entered the cylinder. The disastrous consequences can be imagined. I know that makers have given special attention to the composition of this connection in recent years, but the danger is always there, and apart from the material itself, there is always the joint on the cylinder wall to consider. Engineers who condemn gas engines for hard reliable use do so because, they state, there are too many small things that go wrong. In the preceding system of lubrication, as will be seen, are a mass of endless troubles with dire consequences in certain cases.

Some makers took this line of thought, and instead of trying to eliminate this, decided that the easiest and best way was to take the oil companies into their counsel and find an oil that would be suitable, not only for crank case use, but for cylinder use as well. This was done and, consequently the (b) system of lubrication was adopted. Apart from the ordinary pumps as in (a), the splash from the cranks lubricates the cylinder. Scraper rings are fitted to the bottom of the pistons to prevent over-oiling. The only disadvantage I have found with this system has been that the makers of gas engines have not rendered the help they might by giving the result of tests on oils, leaving one more or less to find out for oneself.

With this type of lubrication, I have found it very hard to hit on the right oil; all my previous experience of different grades proved of no avail. For the benefit of engineers who have not yet done so, or others again who may be considering the installation of this type of gas engine, I will give brief results of the oils that were tried before satisfaction was gained:—

Test 1.—Carbon was found in large quantities in cylinder. Oil changed colour very quickly. Oil company stated the oil was coming into contact with very hot surfaces.

Test 2.—Carbon not quite so bad, but oil changed colour and went very thick and sludgy, evidently through carbon in the oil; also gave off a lot of vapour.

Test 3.—No carbon to any extent was found in cylinders, but the vent-pipe from crank case was like a steam-engine exhaust with the fumes given off from the oil. Naturally it required a large amount of oil to make up losses.

Test 4.—This oil went well for a month or so, until a piston seized, the first that ever happened on this engine. Still, the oil was not condemned at once, and was allowed another life. A few days later another piston seized. The engine was then opened up and examined, and it was found that ridges had worn in the cylinder walls, which only a month or so previously had not shown any signs of wear.

Test 5 (practically eighteen months after first test).—No carbon in cylinder; very little fumes; oil did not change colour for some considerable time; no wear and tear apparent; good gas consumption; the oil lasting well in life and generally giving perfect satisfaction.

Without making this an advertisement, for the benefit of other engineers, the oil on which No. 5 test was conducted was "Vacuum Vectra extra heavy gas engine oil X."

An advantage with this system of lubrication which I have not yet touched is the saving in oil consumed. In system (a), apart from the amount of oil consumed in the crank case, there is an appreciable amount used for the cylinders. A test was recently taken on a Browett-Lindley gas engine, which is lubricated on the (b) system and using the Vacuum oil. The engine used 28 gallons in 1,000 hours, during which 94,755 units were generated. This works out at .028 gallon per hour, or .00029 gallon per unit generated. The test was conducted on a 100-kW set. I think on the larger sets by this maker an even better figure can be obtained, as the

crank case keeps much cooler, and the oil, in consequence, does not break down so quickly. The best way to prevent this breaking down is to draw a bucket or so off each day and filter it, replacing it with fresh oil.

A great deal of trouble is often experienced in filtering these heavy gas engine oils. A very suitable filter can be made by having a large settling tank (placed in a warm position), out of the middle of which a tap is fixed, from which settled oil is drawn. This is passed through a container, in which is white cotton waste, two 32-candle-power carbon lamps being kept burning over the top of the layer of oil on the waste. The oil drains from this and passes through three tubes of varying lengths, partially filled with water. One 750-watt electric heater is placed under these tubes, which keeps the water on the move, particularly in the case of the smallest tube. The oil, after it has passed through these, will be found quite suitable for use again.

THE INTERNATIONAL ELECTROTECHNICAL COMMISSION.

Meetings of the I.E.C. Advisory Committees on Rating, Graphical Symbols, Standard Pressures, and Regulations for Overhead Transmission, as well as Screw Lamp-caps and Holders, already briefly referred to, were held in Geneva, commencing Monday, November 20th, and continuing until November 26th, 1922.

Mr. E. Huber, President of the Swiss Committee, on behalf of his colleagues, welcomed the delegates from the various nations.

The question of the rating of electrical machinery occupied the major portion of the time, being the most important subject, and the principal reason for the convening of the meetings. Sixty delegates were present from 12 nations. Dr. Mailloux, the president, and Col. R. E. Crompton, the honorary secretary of the Commission, were also present.

At the opening session, Dr. Mailloux, on behalf of the I.E.C., thanked Mr. Huber and the Swiss Committee for the excellent arrangements made for the convenience and comfort of the delegates. The preparation for the present meetings, he said, had necessitated a great deal of consultation between the central office and the various national committees, and the general secretary, besides having gone to Berlin, had done everything he could in consultation with the national committees to arrive at an understanding as complete as possible before actually convening the meetings.

The Swiss Committee, in offering the Commission its hospitality, had prepared the way for more complete international accord, and he hoped that the visit of Dr. Strecker, one of the earliest workers in the I.E.C., and his colleagues, as the guests of the Swiss Committee, would be the first step in renewed co-operation with the German electrical industry.

Mr. E. Huber was elected to preside over the technical sessions of the Rating Committee, and arrangements were made for meetings of the other Advisory Committees to be held during the week.

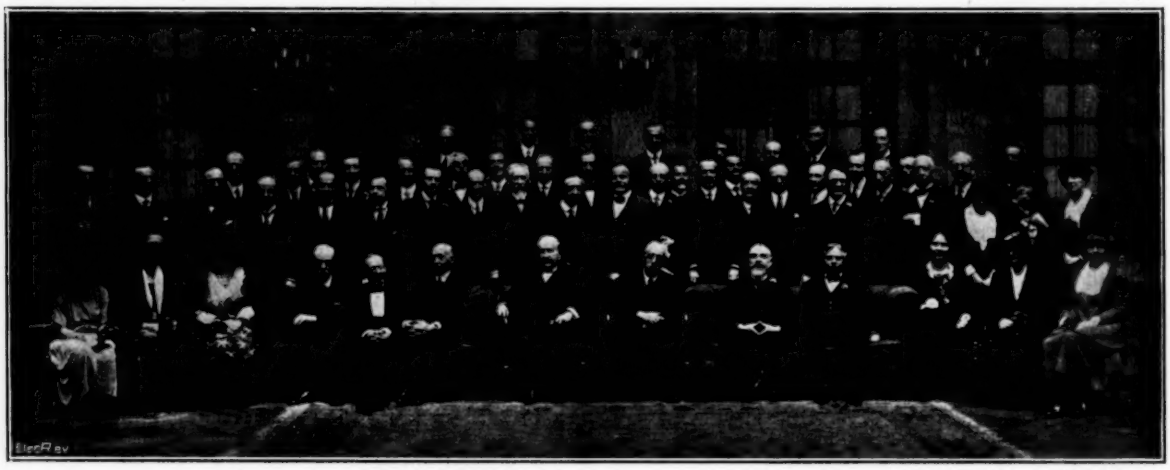
The main object of the meetings of the Advisory Committee on Rating, which was convened principally at the request of the British National Committee, was to consider the difficulties which have arisen in the attempt to introduce into practice the method recommended by the I.E.C. of rating electrical machinery on the maximum continuous load.

The British Delegation stated that it had been found possible to adopt the I.E.C. 50° rating without overload for certain classes of machine, but for the ordinary type of industrial motor and generator the established British practice had for many years past been to rate these machines on a 40° temperature rise with an overload of 25 per cent.for two hours. The British Committee had found itself in a difficult position in its efforts to be loyal to its industry and to the I.E.C. as well; and this was the reason why it appealed to the I.E.C. for assistance in finding a solution of the problem confronting it. The British were most anxious that an overload rating of this nature should be recognised by the I.E.C., and were moreover desirous that temperature rise alone should be specified and that the rating be based on the temperature rise at full load and not on the overload. In Great Britain it should be noted that the cooling air temperature did not exceed 30° C., and indeed was more nearly 20° C., and this overload, therefore, did not produce maximum temperatures in excess of those laid down by the I.E.C.

The British also felt that whilst established British practice with regard to industrial motors gave a more substantial machine than the 50° rating of the I.E.C. without overload, unless the I.E.C. agreed to adopt an overload rating for this class of machine, the rating the British desired to standardise in their own country would not actually be in accordance with the I.E.C. rules, although it might be within them.

Some misunderstanding arose with regard to the question of the temperatures produced on the overload, as an overload rating, if adopted by the I.E.C., would have to be applicable to all countries where the ambient temperature did not exceed 40° C.

The British Delegation, whilst emphasising the fact that the ultimate temperature limits of the I.E.C. had been based on laboratory experience carried out many years ago, and experience with the use of modern materials and methods of measurement might justify a review of the I.E.C. maximum temperature limits, was most desirous of putting forward only such proposals as would be entirely within the I.E.C. limits.



The I.E.C. Advisory Committees at Geneva.

Some discussion then took place as to the necessity of the I.E.C. introducing overloads, seeing that any National Committee was perfectly at liberty to specify overloads in its national rules so long as this did not involve temperatures beyond the I.E.C. figures. In view, however, of the commercial importance attached to this question by the British Committee, the other delegations, desiring to give satisfaction to the British, after further discussion agreed to consider the question of recommending the introduction within the I.E.C. limits of a nominal rating with an overload as an international standard.

In deference, therefore, to the British views, the Advisory Committee, with the help especially of M. Boucherot (France) and Signor Semenza (Italy), endeavoured to find a solution satisfactory to their British colleagues.

The American delegates, whilst they had not come with any preconceived ideas or definite proposals, were at the same time inclined to favour the British suggestion, although they pointed out that there was a tendency in the United States towards a 40° single rating without overload, which would imply a liberally-designed machine capable of carrying both the mechanical and electrical overloads that such machines

had to meet in ordinary service. They urged most strongly that one rating only should be adopted.

In an international meeting of such a nature, much time has of necessity to be taken up with explanations, for in the discussions terms not fully comprehended by everybody are often used and also translations into different languages, and much patience has to be exercised in dealing with the various points as they arise; in some instances time was allowed through adjournment of the official sittings for members of each delegation to discuss details amongst themselves. It was not until the Thursday that, with the help of M. Boucherot, a generally-acceptable proposal embodying the wishes of the British delegates was agreed to, for submission to the National Committees, to the effect that overhead ratings within the I.E.C. maximum continuous rating be recognised and that, for general industrial machines (the class to be defined later) where overloads have to be provided, a machine having a 40° C. temperature rise and capable of carrying 25 per cent. overload for two hours applied at the end of the full-load run be recommended, the overload only to be applied under such conditions of air temperature as will not cause the limits of maximum temperature laid down by the I.E.C. to be exceeded. It will be remembered that the main object of the international rating of electrical machinery is to establish an equitable basis of comparison of tenders, and much discussion took place as to the method of indicating the relation between the proposed British nominal rating and the I.E.C. single rating. To carry this into effect, Signor Semenza suggested, and it was ultimately agreed to recommend, that the rating plate of the machine indicate, in addition to the other information, the output under the ordinary I.E.C. continuous rating (50° C. rise).

With this decision the meetings of the Advisory Committee were adjourned, and the British delegates expressed their thanks and appreciation of the manner in which their proposals had been received. They had fulfilled their obligation to consult the Advisory Committee before introducing into their National Rules recommendations at variance with those of the I.E.C., and in view of the agreement now arrived at, they felt, and the members agreed, that they would be at liberty to proceed with the urgently-required revision of their National Rules, introducing into the new British Rules a lower temperature rise and an overload rating conforming as to ultimate temperatures with the I.E.C. limits, and indicating at the same time on the rating plate the relation between their 40° degree rating with overload and the I.E.C. 50° single rating.

The German representatives, at the close of the meeting, expressed their appreciation of the manner in which they had been received, and said their desire was to resuscitate the German National Committee and its work, and, so far as possible, to bring the German rules entirely into harmony with the rules of the I.E.C.

A meeting of the Advisory Committee on Graphical Symbols was held, with Dr. Wyssling (Switzerland) in the chair. The proposals put forward at Brussels in 1920 were carefully looked through, and additional symbols were added. In the discussion the delegates had before them the graphical symbols issued by the B.E.S.A. (B.S.S. No. 108) and those of the Italian and Swedish and Swiss Committees.

A meeting with regard to Standard Pressures and Regulations for Overhead Transmission was also held, and in this case Dr. Mailloux took the chair.

With regard to the standard pressures recommended to the National Committees by the Advisory Committee at Brussels, the various delegates gave their views. The recommendations made at Brussels, including the proposal to adopt 45,000 (declared pressure) as the intermediate pressure between 30,000 and 60,000 volts were confirmed.

The French suggestion that 120,000, 150,000, and 220,000 volts should be the next stages was briefly discussed, and referred to the National Committees, but without a specific recommendation.

A point was brought forward by Mr. Doane (U.S.A.) regarding the low pressures for electric lighting, stating that a pressure in the neighbourhood of 110 or 115 volts was becoming a necessity from experience in the economic production of light.

The detailed work in respect of overhead transmission was not sufficiently advanced for more than a general exchange of views, but it was agreed to ask the Belgian Committee, which had taken a most prominent part in the question of regulations for overhead transmission, to bring forward for consideration a skeleton set of rules which might be adopted as a guide for all countries.

A meeting of the Advisory Committee on Screw Lamps, Caps, and Holders was also held, and was presided over by Dr. Mailloux. This was the first occasion on which the manufacturers of lampholders in the different nations had come together under the same roof. The ground had been fully prepared by M. Zetter (Paris) and Mr. S. W. Attwell (Great Britain) and also by the Americans, and as a result of an exhaustive review of the situation, the proposal of Mr. Doane (United States) that the lampholder should first be standardised, rather than the lamp cap, was agreed to. Proposals in full detail are to be drawn up in consultation with the experts in the various works manufacturing the lampholders, and are to be put forward at an early date.

The difficulties in the way of accomplishing this much-desired object did not seem so insuperable as had previously appeared, and as the meeting included representatives from France, Holland, Germany, the United States, Sweden, and Great Britain, there is every reason to look forward to an early solution of this problem.

The delegates were entertained at a reception at the Opera House by the Town Council, and at a banquet given by the Swiss Committee. They visited the headquarters of the League of Nations, where they were received by Sir Eric Drummond, K.C.B., the Secretary-General, and where the aims and objects of the League were fully explained. A visit was also paid to the works of Messrs. Sécheron & Co., where large electric locomotives were in process of manufacture.

Special arrangements were made for the delegates, by electric tramcars and automobiles, to visit the water-power works erected on the Rhone at Chauzy-Pougny.

In addition to the honorary secretary (Col. R. E. Crompton, C.B.) and the general secretary (Mr. C. le Maistre, C.B.E.), the British delegation comprised:—Mr. Attwell, Mr. E. G. Batt, Mr. A. R. Everest, Sir Richard Glazebrook, K.C.B., Mr. P. Good (Secretary, British Committee), Major H. Gunton, Mr. P. V. Hunter, C.B.E., Mr. J. S. Peck, Mr. C. Rodgers, O.B.E., Mr. Roger Smith, and Mr. C. C. Wharton. India was represented by Mr. J. W. Meares.

SOME OTHER WIRELESS ASPECTS.

By W. A. C. PHILLPOT.

On searching the index of the papers read before the various institutes during the past year for a suitable title for a scientific treatise I find that some aspects appear to be compulsory. In mine, therefore, I have endeavoured to show a fitting respect for established precedent without slavishly adhering to the hide-bound traditions of a hoary antiquity.

Wireless has always appealed to me as being about the least interesting hobby in existence for the man without curiosity as to his neighbour's affairs, and, until lately, I fancied that this fact alone accounted for its tremendous popularity. Another manifestation of the parlourmaid instinct I thought it, without danger from draughts, and the fact that the further off the people whose domestic chat was overheard the better the listeners liked it I put down to common prudence. I admit that I have myself felt the hypnotic influence of the gentleman with the painfully well-off voice who discourses from the Strand, but to say that I ever said: "Please Sir! it wasn't me" in reply to his complaint about somebody's fit of reactance while I was listening-in with a sixpenny crystal set, is an absurd canard, and I take this opportunity of denying it.

Recently, however, I have discovered another explanation of the popularity of the sport, but till now have been unable to classify it as either a primary or secondary cause.

Briefly, I find that it enables large numbers of gentlemen, whose opportunities would otherwise be limited, to talk in scientific language—the radiatic dialect—and the remarkable skill shown by the experts in bringing unseemly words into ordinary speech has never been equalled since Harris's famous report of his journey up the Matterhorn to Mark Twain.

Holding these heterodox?—dyne?—which is it?—views on the subject it is but natural that the buffoon, Fate, should bring me in daily contact with such numbers of radiacs as would satisfy Marconachi (as I have heard an ex-service enthusiast call him) himself.

In certain emergencies—between twelve and one—it is my duty to endeavour to sell wireless oddments to persons with money enough to buy them, and Fate, of course, sends more customers to my crowded hour of glorious life than come to our own expert in a day. For my assistance the various articles we sell are put on labelled trays, so that when De Jones, Junior, requires a filament rheostat I do not send him away with the insulated pliers. This seems simple, and if De Jones came alone or silent I could bear up under the strain, but, unfortunately, he usually brings Montmorency with him, and they brag and lie about their toys and drag in long words, and try new ones on me and each other, till I find myself unable to speak or write a word without an "ic" in it.

For instance, De Jones came along a day or two ago on his motor cycle bringing Montmorency with him on the carrier. Just before he arrived it happened that the shop charwoman had swiped all my samples off the trays and reset the scene by the light of nature. Some instinct seemed to tell me that "50 ft. h.d. copper" could not be made of glass, so I refused to sell anything until the real wireless merchant came back, but this did not deter De Jones. He had come to show Montmorency how much he knew in the place where they were supposed to know it, and he did. He turned to a thing with a knob on it—nearly all our things have knobs on—and remarked that it looked a rotten sort of variometer. Montmorency, game as a pebble, countered with a duolateral, to which De Jones promptly responded with atmospherics. This appeared to be a tactical error, as Montmorency had heard it before, and he slipped in a couple of variable condensers and an amplifier with telling effect. De Jones, recognising that his opponent carried too many guns, retired with a side slap

at the non-combatant—me—a suggestion that they come back when somebody who *knew* something was there. The scientists returned to their motor-bike, but as some layman had taken the opportunity of pushing back the spark lever, when De Jones gave his starting kick the silencer barked once like a dog and was silent. From the shop door I suggested advancing the ignition and De Jones thereupon hacked an inch off the magneto lead, in such a manner as to make perfectly plain the subtle mind process which told him the shorter the distance the spark had to go the quicker it would get there.

This is by way of an appetiser; the full meal—which feeds me right up—I get when compelled to listen to a discussion between two of the bigheads of the local "Wireless-er-Radio-Society." They begin civilly enough, as a rule. Bighead A. will offer Bighead B. a couple of wave-lengths, for an inter-valve transformer with cantilever springing. This will be taken up and a counter offer of some high resistance for a second-hand brass formula will be made and accepted. Then A. will gently extol the virtues of an air dielectric he has, to which B. will reply that his is better and has his name engraved round the edge. A. makes ground with a remark caught with the dry fly between an air-pilot in New Zealand and his passenger; and B., not to be outdone, produces a 7 lb. curse from Kamchatka that he picked up on the spokes of a bicycle wheel. At the point where they pass on to the remarkable performances of their respective friends' sets ("My big bruvver's bigger'n your big bruvver") I leave them.

I had occasion to-day to dispose of an elderly wireless clergyman; a few high-frequency oscillations with a blunt instrument and I had tuned him up. A curious document was found on the body, laid out in the long and shorts of the pious and immortal one. Translated into a language it ran roughly as follows:—

"To my wife, Ann, whose distaste for scientific pursuits I have deeply deplored, I leave my

Loud Speaker and second-best Receiving Set

in token of my forgiveness.

To my daughter, Etheria, I leave my crystal detector and

Honeycomb Coils

in grateful recognition of the sweetness of her disposition.

To my son Hertz, who has shown himself in many respects an undutiful child, and has spoken disrespectfully of a microfarad, I leave my

Basket Inductance

with the string handle.

I leave my tuning inductance and super-regenerative circuit to the Asylum for the Deaf and Dumb, and to my cook, LNOR, I leave my pancake of seventy turns, as a slight acknowledgment of her capacity.

To my brother Thomas, should he survive me, who has always prided himself on his hard-headedness, I leave my

Block of Ebonite.

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

ANNUAL REPORT.

The fourteenth annual report of the Hydro-Electric Power Commission of Ontario, covering the year ended October 31st, 1921, is a volume of 530 pages, containing a vast amount of statistics, which clearly indicates the wide extent of the Commission's activities. The size of the report renders adequate treatment in our limited space out of the question, but in the following review the progress made is briefly recorded, with other facts of particular interest.

At the end of the year the Commission had a total length of 2,042 miles of transmission lines in service, nearly half of this being part of the Niagara System, which is the largest of the Commission's undertakings. This total did not include the 110,000-V steel-tower lines of the Niagara system or lines acquired by the Commission, which represented a further 960 miles. During the year the addition made to transmission systems amounted to 170 miles, the principal extensions being in the St. Lawrence and Thunder Bay systems. It is of interest to note that by far the greater part of these additions (149 miles) was of steel-reinforced aluminium. The 110,000-V steel-tower lines had a total length of 467 miles and a further 55 miles was being constructed. The latter includes a line from Queenston to Burlington. The type of tower employed is shown in fig. 1.

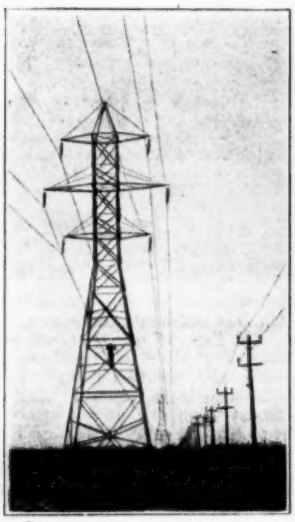


Fig. 1.—Standard Suspension Tower, 1920 Type.

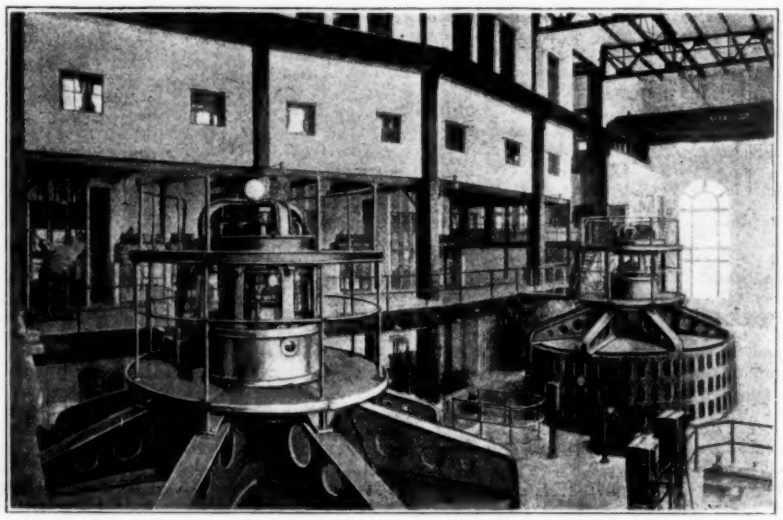


Fig. 2.—Interior of Nipigon Power House (Incomplete).

In the report upon the operations of the various systems it is satisfactory to note that the power demand increased to a considerable extent. In the Niagara system the call for power was so great that arrangements had to be made to obtain 39,000 h.p. from power companies until the power from the Queenston-Chippawa system was rendered available. The operation of the Niagara high-pressure station was practically continuous (99.987 per cent.), there being only one total interruption of supply due to the failure of station equipment. On 64 days of the year electrical storms were experienced, but the lightning arrester equipment proved reliable, and damage to the system was avoided. The increased demands necessitated the installation of additional transformers at a number of local stations. Condensers of 5,000-kVA and 10,000-kVA capacity were introduced during the year with beneficial results to the system, especially in improved voltage regulation. The principal feature of the year's constructional work on this system was, of course, the progress made with the first part of the Queenston-Chippawa system, but as this is now in operation the record is rather out of date. The development has been dealt with from time to time in our pages, and the first two 55,000 h.p. sets were placed in commission early this year. The third set was to have been started in August or September. In June, 1921, the constructional work was seriously retarded by the destruction of the Montrose distributing station by fire. The destroyed plant was temporarily replaced by borrowed equipment, and the service was restored within fifteen days.

The plant of the Ontario Power Co. suffered breakdowns on two occasions. One totally-enclosed generator and a semi-enclosed generator had their armature windings totally destroyed by burn-outs, the staff being unable to get at the fires to extinguish them. As a result of these mishaps it was

decided to employ only open-type end shields in future, and arrangements were made to have these fitted to the machines.

Throughout the Niagara system the principal transformer stations were improved and their capacity increased. Similar operations were carried out in the Severn, Eugenia, Wasdell's, and St. Lawrence systems. In the last the principal improvement was the substitution of four 5,000-kVA transformers for the same number of 1,250-kVA transformers. The Almonte municipal plant, in the Rideau system, was increased by the addition of a 200-kVA, three-phase generator.

Next to the Queenston-Chippawa development the most important work was the construction of the Nipigon generating station—part of the Thunder Bay system. To enable the city of Port Arthur to be supplied with power upon the termination of its contract with the Kaministiquia Power Co., it was decided to complete the erection of the first of the 10,600-kVA generators and to install temporarily two of the 8,000-kVA transformers. This preceded the completion of the building, and temporary wooden walls were erected to protect the plant. This first section was put into operation on December 20th, 1920; the second generator commenced work on March 14th, 1921. A view of the interior of the station is given (fig. 2). The power from these machines was dealt with by temporary switching equipment until August 7th, 1921, when the permanent high- and low-pressure switchgear was ready for service. The power was at first supplied to Port Arthur at 62,500 V, but the pressure was subsequently raised to 110,000 V.

In the Central Ontario system the equipment at several generating and transforming stations was improved and extended. The Ranney's Falls generating station, with two 5,000-h.p. sets, was proceeded with, and it was hoped that power would be available early in the present year. The capacity of the Nipissing generating station was increased by the installation of a new 1,400-kVA Canadian-Westinghouse generator and three 900-kVA transformers. The replaced plant was to be removed to other stations.

The total capacity of the transformers installed or ordered by the Commission at the end of the year covered by the report was 1,043,386 kVA, and a complete list of sub-stations is given in the report. The largest sub-station was that at Queenston, which had a capacity of 225,000 kVA; the Niagara sub-station followed closely with 202,000 kVA.

During the year surveys and storage studies were made on the St. Lawrence between Prescott and Cornwall and other sections, and also on the Trent, Crow, and Seguin Rivers.

A large number of municipalities received engineering assistance from the Commission, and great advances were made in the provision of power to rural districts. In the Niagara system over 3,000 applications were received, and reports from all over the province indicated increasing recognition of the benefits which the Commission has in its gift.

On the financial side the showing is most satisfactory. The annual surpluses, after providing all possible cost of operation, including an adequate depreciation charge, have increased, until, in 1921, the combined annual surpluses of the municipalities amounted to $619,726. The total plant value increased from $10,081,469 in 1913 to $31,656,855 in 1921; and the total assets from $11,907,827 to $40,111,979. The liabilities have not increased in the same proportion as the assets, rising from $10,468,352 to $25,434,258. The reason for this is that much of the cost of the increasing plant value has been financed out of surplus and reserve accounts without increasing the liabilities of the various systems. There has been a steady decline in the ratio of net debt to total assets. This was 88 per cent. in 1913 and 63.3 per cent. in 1921. Out of 205 municipalities only 32 failed to meet their actual cost of operation without regard to depreciation, and 11 of these had been in operation for less than a year. A total of 51, including the above, failed to provide full theoretical depreciation in addition to operation and maintenance expenses. These showed a deficit of $86,069, but the profits of $705,795 earned by the remainder gave the net profit for the whole indicated above.

Over 200 pages of the report are devoted to details of finance, consumption, rates, and other items of interest relating to the municipalities served by the Commission. A casual study of the tables is sufficient to give an idea of the rapid growth of the system—only in a very few cases is there any indication of retrogression, and in none of these is it serious.

Other tables form a record of the extent and cost of street lighting in "hydro" municipalities, and, so far as can be judged by mere figures, it would appear that Ontario townships are, generally, in advance of a great number of British towns of larger populations. It is seen that in the majority sums ranging from one to two dollars per head are spent on public lighting. Typical examples of the extent to which towns are electrically lighted may be given. Acton, with a population of 1,594, has no less than 165 100-W lamps in service—the cost per head being $1.15 per annum. Among the larger cities is Hamilton (population 114,766) which employs 7,600 100-W lamps and 1,200 ranging from 200 to 500 W. The cost per head per annum is $0.57. The rates charged to municipalities for bulk supplies of power are also given in tables. These are only estimated figures, the total charge being adjusted at the end of the accounting period, so that only the actual cost of supply is paid.

With regard to railways, it is stated that bonds to the extent of $900,000 were guaranteed by the Government for the improvement and extension of the Essex district system. The City of Guelph radial railway was taken over and bonds to the extent of $150,000 were issued, to enable improvements to be carried out.

A great deal of routine work was carried out in the Commission's laboratories. High-pressure testing assumed large proportions. The Commission has apparatus for obtaining single-phase voltages of 200,000 at 25 cycles, and 400,000 at 60 cycles. In the Photometric Section many new lighting devices were tested, and in the Structural Materials Laboratory a large amount of work was done for the benefit of the Commission's constructional department. The volume is illustrated with about 40 views and 16 diagrams, and a map of the system is provided.

The "Murray" Report on Electrical Undertakings.

Commissioners' Reply.

Messrs. Murray & Flood, a firm of United States consulting engineers, received a commission some time ago to prepare a report comparing electrical undertakings or "utilities" owned by the public and those in private hands. The result was a voluminous report in which government ownership was strongly condemned—the Hydro-Electric Power Commission of Ontario being the example of public ownership chosen. Mr. W. S. Murray signed the report and from this fact it was termed the "Murray Report." The Commission has now published what purports to be a complete refutation of the statements made in the report. Sir Adam Beck, the chairman, in a foreword says that the report is represented to be "based on an impartial and exhaustive study" of the materials freely supplied by the Commission. Eighty-five per cent. of the contents consists of information epitomised or otherwise arranged by the author from data supplied by the Commission, while in the remainder the privately-owned utilities in the United States are dealt with, but only in an incomplete manner, giving no adequate indication of the sources and limitations of the information. Sir Adam points out that the undertaking with which he is connected is not "government-owned," but is an example of co-operative municipal ownership working through the agency of independent commission control and administration, entirely free from any political interference. It is claimed that the Murray report is not "exhaustive" and "impartial" as stated, and, embodying, as it does, such fallacious methods, its conclusions also are necessarily unsound. Mr. Murray is said to have made many statements at absolute variance with well-known facts, but we have space for only a few of these.

In connection with the Queenston-Chippawa development, Mr. Murray stated that, in his opinion, such work should not have been carried out during the period of high costs of labour and material, and as a consequence the rates charged for energy for this source would constitute a serious burden to consumers. The Commission states that the development was absolutely necessary and that the power produced by the first projected development of 300,000 h.p. would have been insufficient to meet demands, and an increase to 450,000 h.p. was necessitated. It is shown that the power generated by the first two units was absorbed in a very short time without taking the load from other stations, and this in spite of the existence of trade depression. To arrive at the cost of power Mr. Murray is said to have deliberately inflated capital charges by assuming interest at the rate of 8.15 per cent. instead of the actual rate of 5.75 per cent., thus adding a false annual charge of $1,652,500. By this and other means the annual production cost is raised to $12,310,000—as against a corrected total, even under his own assumptions, of $7,200,000, or $25.60 per h.p.-year as against $14.00. Finally, it is made clear by the Commission that without the Queenston-Chippawa development, the municipalities would be experiencing a shortage of 125,000 h.p. which would be daily increasing. Mr. Murray averred that the Commission's methods of charging favoured municipalities near to the source of supply, tending to concentration of industries near the main transmission lines, and the retardation of the development of outlying districts. Apart from the fact that this is not the case, Mr. Murray naïvely admitted later in the report that "the transmission distances to reach their customers are generally greater than those of the private companies compared thereto."

The Nipigon development (Thunder Bay System) was also criticised as being unnecessary. Mr. Murray said that this with the power supplied by the Kaministiquia Power Co. would provide 3 h.p. per head of population, five times the *per capita* power available in the Niagara System. The two districts are not comparable; the Thunder Bay district has numerous pulp and paper mills, and grain elevators involving the employment of a small number of men, while the Niagara district is more thickly populated, being principally an agricultural district. Contrary to Mr. Murray's assertion, the Kaministiquia Co. was quite unable to meet all demands. The plant, although of a capacity of 35,000 h.p., can only generate 16,000 h.p. continuously, owing to the nature of the water supply. It is shown that the work was undertaken at the urgent request of the Provincial Government and the municipalities. The Murray report claimed that an alternative power

site would have been preferable—the Kaministiquia River and Dog Lake, but the Commission presents data showing that whereas the mean dependable flow at the Nipigon development is 6,500 cu. ft. per second at all sites, the flow at the most favourable point of the suggested alternative site is only 1,000 c.f.s. The comparative estimated horse-power at a 50 per cent. load factor is:—Kaministiquia, 71,000, and Nipigon, 280,000. All other considerations favour the Nipigon schemes. The Commissioners' reply asserts that "Mr. Murray's unprofessional handling of the engineering data relating to the subject of storage on the Nipigon River is, of itself, sufficient to discredit the whole presentation."

Mr. Murray, on the question of costs to consumers, set out to compare California and Ontario. This was done by contrasting an undefined "section of California analysed" and the Hydro systems "*other than Niagara.*" When it is pointed out that six-sevenths of the Commission's power is derived from this source further comment is unnecessary. The ostensible reason for adopting this method was that the people of the Niagara district enjoyed special advantages in having Niagara Falls as the source of power.

The cost of street lighting was found by Mr. Murray to be from 53 to 60 cents per head in Buffalo (N.Y.) as against 67 cents in Toronto, but he omitted to mention that this only represented the electrical half of the Buffalo lighting. The actual cost was $1.15 per head, owing to the use of gas and gasoline; Toronto is wholly electrically lighted.

The Commission admits that although the price of power for lighting and municipal services is higher in Buffalo than in Toronto, power charges are lower on an average. This is said to be due to the marked discrimination made in favour of power consumers as against domestic consumers by the supply companies. The overall average price is, however, shown to be much higher in Buffalo than in Toronto, and with the exception of a few specially-favoured very large consumers of power, the average cost of electrical energy to the people is much higher in Buffalo for every class of service. In support of its contention the Commission gives tables of *actual* charges, a method not adopted by Mr. Murray.

The Commission's refutation concludes:—"Inasmuch as the 'Murray Report' has been shown to be permeated by misrepresentations and unjust statements, it is, after all, seen to be but one more of those impotent attempts which, from time to time, have been made to discredit the outstanding achievements of the co-operating hydro-electric municipalities of the province of Ontario."

EAST OF SCOTLAND ELECTRICITY DISTRICT.

Commissioners' First Inquiry.

On December 12th the Electricity Commissioners opened a public inquiry in the City Chambers, Edinburgh, with regard to the reorganisation of the East of Scotland Electricity District. Sir John Snell presided, accompanied by Sir Harry Haward, Mr. H. Booth, and Mr. W. Lackie, with Mr. E. W. Hudson as solicitor and Mr. D. S. Cumberlege as clerk. Mr. H. P. Macmillan, K.C., Mr. W. S. Kennedy, and Mr. T. W. Cooper appeared for the Edinburgh Corporation; Mr. Morrice Mackay, K.C., for the Scottish Central Electric Power Co.; Mr. F. A. Gentles, K.C., for the County Councils of Midlothian and East Lothian and the burgh of South Queensferry; Mr. R. H. McConnochie for the Leith Dock Commission; Mr. J. R. Dickson for the North British and the Caledonian Railway Companies; Mr. Garrett for the National Electric Construction Co.; and Mr. Henderson for the West Lothian County Council.

Mr. Macmillan, K.C., said that surrounding the City of Edinburgh were country districts which had hitherto only been developed electrically to a very small extent, and he referred to the new Portobello power station which the Edinburgh Corporation was completing, and its capacity to supply all the electricity required. Distribution in the county area outside the City of Edinburgh would be undertaken by authorised distributors receiving their supplies in bulk on agreed terms from the Edinburgh Corporation. The name might be changed to Lothians Electricity District. The County of Peebles objected to the inclusion of the parishes of Eddleston, Newlands, and West Linton. The Corporation of Edinburgh had no desire that these parishes should be unwillingly brought into the area. Objection was also taken to the inclusion of a portion of the County of Linlithgow. That portion was within the area of the Scottish Central Electric Power Co., which, while not operating, had Parliamentary powers. Edinburgh Corporation did not think the exclusion of that area would diminish the utility of the scheme.

Mr. Gentles, K.C., said that the burgh of South Queensferry would prefer to be associated with Edinburgh rather than with any other authority, but it left the question of its inclusion or exclusion in the hands of the Commissioners, whose function it was to see how South Queensferry could be most economically supplied.

Mr. Morrice Mackay, K.C., said that the Scottish Central Electric Power Co. was prepared to provide for South Queensferry, and was in a very favourable position to supply that burgh. It had a very efficient power station at Bonnybridge.

The Commissioners agreed to the exclusion of the Peeblesshire parishes from the proposed area, and were of opinion that the five parishes in Linlithgow should also be excluded.

Mr. Ian C. Murray, secretary of the Scottish Central Power Co., gave evidence as to the ability of the company to supply South Queensferry.

The Commissioners stated that when South Queensferry obtained distribution powers, if the Scottish Central Power Co. could not supply it economically, it would obtain a supply from the Corporation of Edinburgh.

Mr. Macmillan, K.C., addressed the Commissioners on the main scheme as applied to Midlothian and East Lothian. He said that the Edinburgh electricity undertaking was efficient, economical, and profitable, in the sense of having a reasonable margin upon which to work. The Corporation had done all that, although in the last few years it had been seriously handicapped because the stations had been working with plant which was to a large extent obsolete. As to the future of the Edinburgh electricity undertaking, everything pointed in the direction of improvement in the public interest. Edinburgh could borrow money on easy terms, which was very important with regard to future expansion. When the Portobello power station was working, the Corporation would be able to generate electricity far more economically than hitherto. The idea was that ultimately the undertaking should be capable of meeting all demands from the area of Edinburgh and the two surrounding counties. They had already got a responsible Corporation with an existing site, and with a capital station already constructed, capital liabilities all incurred, and expenditure already met. That simplified the position to a remarkable degree. The Corporation would maintain its two old stations as a stand-by, and Leith would be a substation.

Mr. Macmillan explained that the promoters were under no obligation to set up a joint electricity authority, and the Commissioners could only resort to that form of administration if they found it necessary to do so in the public interest. If they considered the peculiar position of Edinburgh, where the whole responsibility with regard to the generation of electricity for the district rested with the Corporation, and where the district was already satisfactorily provided for, there was, so far as the Corporation was concerned, no need for another administrative body. Edinburgh itself did not require any more powers; it generated electricity under its existing Orders, and it distributed within the whole of the county area. It could obtain from the Commissioners power to supply in bulk outside its own territory. There would be no opposition from local authorities, or companies, outside Edinburgh. They would much rather be permitted to have a scheme which would dispense with the joint electricity authority proposed, and, on the other hand, introduce an advisory committee or an advisory board.

Mr. R. W. Horgarth, M.Inst.C.E., of Messrs. Buchan and Partners, consulting engineers, Westminster and Edinburgh, in reply to queries by Mr. Cooper, for the Edinburgh Corporation, said that in the Counties of Midlothian and East Lothian there was a large industrial field to be tapped apart from the collieries, there being many paper mills and engineering works in the area. There were 890 farms and 218 country houses, all of which, taken collectively, would give a valuable market for the energy to be supplied, and there were townships which at present had no supply. The great bulk of the industrial field to be developed lay within a twenty-mile radius from Portobello power station, which was therefore admirably situated for the supply of the area and for the efficient and economical development of the scheme.

In reply to Mr. Gentles, K.C., Mr. Hogarth said the County Councils found it an impracticable thing to take upon themselves, in the meantime, the risk and expense of distribution of the supply in their respective areas. He thought their position in that respect was sound.

Mr. Robert Paton, Edinburgh City Chamberlain, in reply to Mr. Macmillan, said that on May 15th last the total amount of loans sanctioned in connection with the Corporation's electricity undertaking was £3,044,514, and the amount actually borrowed was £2,395,126. There had been repaid by sinking fund 40 per cent. of the total amount borrowed. As to Portobello station, the position at May 15th last showed that a considerable part of the estimated cost had already been provided for. The estimated cost of the station was £1,124,000, and the actual expenditure to that date was £553,263; estimated cost of mains, £275,000, expenditure, £137,186; substations estimate, £207,000, expenditure £65,016; total actual expenditure at May 15th, £755,465, as against an estimate of £1,606,000. About half of the capital required had been found at the close of the financial year, and since then there had been a further large expenditure on the undertaking. In the last six months a further sum of £400,000 had been spent on the station and mains.

Councillor W. Bruce Lindsay, Convener of the Corporation Electricity Committee, said that the rates for current compared very favourably with those in any other large town. In the event of a joint authority being set up he thought Edinburgh should have a predominant representation, but he considered that it would be superfluous to set up another body. The Corporation supplied electricity at as nearly cost price

as possible. The County Councils shared the view that a Joint Authority was unnecessary. Any matter in which the National Electric Construction Co. was interested could be settled at a conference for the purpose.

Mr. W. B. Cownie, managing director of the National Electric Construction Co., said he had no difficulty in coming to the conclusion that, provided they could get a proper supply of electricity from Edinburgh on satisfactory terms, the scheme was one which he could recommend, but he was not prepared to say that the bulk supply price was as good as it might be. He did not think there was any necessity in this case for a Joint Authority in view of the fact that all the finance for the generating station was provided by Edinburgh. The Counties had no financial interest in the scheme.

Mr. George Cruickshank, County Clerk of East Lothian, said that his County Council felt that the Edinburgh Corporation should have such a majority on the governing authority as in effect would make it the Joint Authority.

Mr. A. T. Asher, County Clerk of Midlothian, said his County Council was very much opposed to the suggestion that there should be a Joint Authority; Edinburgh Corporation would naturally have a prepondering voice, and the setting up such an Authority might or might not involve considerable expense.

At the close of the evidence,

Mr. Macmillan, K.C., in addressing the Commissioners on behalf of Edinburgh Corporation, said the three topics with which they were concerned at this stage were—area, supply, and administration. Area was agreed to by all parties. All were also agreed that the capital station at Portobello was the proper and suitable source of supply. The method of distribution in the County Districts was a problem of no little difficulty, but it had been solved. The County Councils, not desirous of incurring expense at this time in the matter of distribution, wisely preferred to get into touch with a company, which would be disposed to undertake the risk and find the necessary capital. They had been fortunate in finding Mr. Cownie (National Electric Construction Co.) at hand, and in coming to an arrangement with him to put the resources of his company into operation. The Corporation had been no less fortunate in coming to an agreement with him to take from Portobello large supplies. From the point of view of the county areas, the whole mechanism of the scheme had been provided for, and it would necessarily proceed by degrees. He urged upon the Commissioners that this was a case in which it would be undesirable to duplicate administration. The Corporation, however, would in no way resent, but would rather welcome in this scheme, in lieu of the Joint Electricity Authority, the insertion of certain clauses which would ensure that the Electricity Commissioners would have proper power of general direction and control over all parties in the area. The area being fixed, and supply and distribution well provided for, he submitted that administration would best be dealt with by leaving matters as they were.

This concluded the inquiry.

SALESMANSHIP: INTERVIEWING THE PROSPECTIVE BUYER.

The last of the three lectures by Mr. Wallace Attwood, at the Salesmanship Conferences of the Electrical Development Association, was given on December 15th at Caxton Hall, Westminster. Mr. W. C. Lusk (managing director, British Thomson-Houston Co., Ltd.) presided.

Mr. Attwood gave as the title of his third lecture "Managing the Interview," and outlined the course to be followed by a salesman from the preparation for an interview to the actual clinching of a sale. He did not think that salesmen prepared themselves sufficiently before actually going to see a prospective customer, or "prospect," as he consistently called him. A salesman must first fix his objective and determine the motives which would impel the customer to be more willing to buy the goods than to refuse. The motives that moved people were set out as natural instinct, emulation, pride of possession, weakness, and hope of gain. The lecturer said that when a prospect was informed that somebody wished to see him he was instinctively on his guard. Therefore, he must be made to *want* to see the caller. His curiosity must be aroused, and amusing instances were given of how this could be done. Sometimes there was an obstacle to be encountered, in the shape of a commissionaire or a clerk, in which case it was necessary to enlist the personal interest of that person. If a salesman could not interview a prospect alone in his office, but in a little inquiry office, where he could not demonstrate his goods effectively, then it was better that he should not do so at all, because the prospect would be irritable and uninterested, whilst the salesman was uncomfortable and could not do himself justice. He urged the salesman to fight against handing in his business card, because it was difficult to make a card speak on his behalf.

Having approached the prospect, the first thing to do was to make some remark which would interest him. There was not, he said, enough "ferociousness" in selling, and he was a little tired of salesmen being too pleasant to the prospect. The salesman, having prepared the interview, and chosen his time, was in a better position to manage the interview than the prospect, and he should see that he did handle it, and gain the respectful attention of the prospect. A salesman must not suffer indifference on the part of his prospect, and if he could not be humoured, then some more vigorous method should be adopted. The case must be presented logically, and the salesman must appeal to the reason of the prospect. There would probably be interruptions, such as a telephone message, and it was important that the salesman, when resuming his argument, should discuss points which would serve to take his listener's mind off the subject of the telephone conversation before taking up the trend of his main argument. It was useful to test the interest of the prospect at intervals, by making a remark which called for some comment. The lecturer instanced a number of ways of appealing to the imagination of the customer and interpreting the goods in terms of himself.

Then came the problem of closing the interview, and the lecturer supposed that only one man in a hundred could clinch a sale well. When a salesman reached the end of his argument he should pause and then break off at a tangent, appealing to the reason of his prospect, his business instinct, &c., so that it was difficult for the prospect to turn back and say "No!" Weakness was the usual motive that made a customer buy. If, however, an interview did not end successfully, then there were many ways by which the salesman could keep the next move in his own hands so that he could pick up the threads at a later date.

In conclusion, Mr. Attwood said that the lectures were intended to cover broadly the aspects of selling. He then dwelt on the importance of salesmanship from a national point of view in reducing unemployment. We in this country had not had many years in which to study selling; we were only on the fringe of it, and if salesmen could sell more of their products, they would be doing the country a signal service.

Mr. E. Sharp asked how Mr. Attwood would deal with a case in which a salesman had to face a small boy who had no influence with the prospective buyer, and whose sole duty was to fill up a printed slip with the name of the caller, stating his business, and whether he had an appointment. There was also the case of the purchasing agent, a man whose job it was to interview people. He was always pleasant, but could only tell a caller that his tender was receiving consideration and that he would be notified in due course.

Mr. Attwood, referring to the purchasing agent, said that if all callers were on the same footing, then the tender which was favourable on the face of it would be successful. Having ascertained from Mr. Sharp that the purchasing agent he had in mind did the actual purchasing, but did not let the salesman state his case, Mr. Attwood pointed out that there was a lot of selling done on paper. Why not put salesmanship into a tender, and make it distinctive? The office boy should be impressed with the fact that his employer was missing something which he really wanted if he did not see the salesman, and Mr. Attwood urged the importance of always giving the boy a definite message to take to his employer. If it were necessary to use a business card, it was very helpful to write a short sentence on the back which would appeal to the prospect.

Mr. F. W. Levers asked for Mr. Attwood's opinion of the greater use of the telephone.

Mr. Attwood replied that, where one had to make snap decisions, such as when prices were fluctuating a good deal, it was all right to use the 'phone, but perhaps it was not well to use it when goods had to be considered carefully. But the salesman ran a risk of being turned down on the telephone, and he closed the door against himself. He (Mr. Attwood) preferred to call first, and if he could not get in to see the prospect, then he had a reason for 'phoning afterwards.

Mr. H. H. Curtis asked for help in trying to sell a motor. The buyer wanted a motor, but the salesman was in competition with others whose prices were much the same. Also, in cases where a salesman had to depend upon his tender, could Mr. Attwood outline a letter which would assist.

Mr. Attwood said there were very few people who knew how to write a sales letter. The first word of a sales letter, as far as possible, should be "You," instead of "I" or "We." He put it forward as a principle that a salesman should never run down a competitor's goods. He recognised that in such a case the salesman was trying to sell his motor to a man familiar with the technicalities, and whenever the prospect put forward a counter-suggestion, the salesman should always be able to meet it with a "but." If prices were the same, the salesman could only hope to sell if his product had a special feature which would give a little better service, and if there were no difference between the products of the competitors, then it was a question of personality.

Mr. R. A. Lower asked whether Mr. Attwood considered it policy to force a sale on an unwilling buyer.

Mr. Attwood said he must have given a wrong impression. He had said all along that the salesman must appeal to the reason of the prospect. He did not believe in a forced sale unless the salesman could come back at a later period knowing that the purchaser would still be delighted with his purchase.

Mr. H. T. Young mentioned a case of a retailer who was always easy to get at, but a salesman could not get an order from him. It was a difficult case, but the salesman had secured an order by placing a large order himself with the retailer, who at once felt under an obligation to him to return the compliment.

SALESMANSHIP CONFERENCE AT NEWCASTLE.

The third conference on salesmanship in the electrical industry (North-East Coast) was held in Newcastle on December 7th. Mr. N. W. Prangnell, M.I.E.E., occupied the chair, and the speaker was Mr. W. E. Warrilow, A.M.I.E.E., who took for his subject "Advertising and Salesmanship."

Mr. Warrilow explained that he did not propose to touch upon the heavier side of the question of advertising in its relation to sales. He proposed to deal with the promotion of the sale of electricity consuming devices and the extension of electric service. Advertising had an immense influence on sales. He did not propose to deal with the advertising value of showrooms. He was mainly concerned with the influence of printed literature on sales. The electrical industry was comparatively new to "live" advertising, and they were fortunate in that respect because they could now take advantage of many improvements in printing art and engraving. The constant change of "copy" was something like the constant re-appearance of the traveller at the door of the buyer.

There had been no more advertised electrical product than the lamp, and the influence of advertising on sales had been undoubted. The same sort of advertising had also been of great value in other branches of the industry. The wiring firms were now taking an interest in it, and they were doing excellent poster work. It was an indirect kind of advertising which tended to create demand. There was an enormous amount of work still to be done in that field, and at present the manufacturer was bearing the chief portion of the cost. Neither the wholesaler nor the contractor contributed a great deal towards electrical advertising. It was, however, noteworthy that the manufacturer had seen the importance of it.

He then gave details of a scheme of advertising which in his opinion encouraged mass production. A manufacturer of a particular article started a campaign in which he bought the front page of the *Daily Mail*. The page was then divided into different designs showing the uses to which the article could be put. Below that was a list of names of wholesalers who, in response to the manufacturers, ordered, say, a couple of dozen. For the price of the two dozen the purchaser could secure an advertisement on the front page of the *Daily Mail*. That method had been tried by several firms with the very best results. The advertising helped to sell the article. The contractor and wholesaler had sufficient confidence in the proposition to give the manufacturer an order which would enable him to put in hand, say, 10,000. They ought to aim at the standardisation of the product, as the more that was done the greater influence would the advertisement have upon sales. On the supply side enormous difficulties existed owing to lack of uniformity in voltage. There again the advertising man felt that anything in the way of a universal campaign was difficult to organise because it was not possible to sell a sufficiently small average number of articles to make the appeal general throughout the country. Unification of voltages was an ideal towards which they were moving. The work of E.D.A., which was after all advertising work, was receiving greater support from all branches of the industry, and it presented a platform upon which the many and conflicting interests could meet. Manufacturers, wholesalers, and contractors could, through it, contribute to the common fund for increasing the demand for electrical service.

Advertising presented great opportunities to men who had experience and training in electrical work. Some people believed that an electrical salesman who had no knowledge of the industry could be trained. That was a fallacy.

The problem was now falling more or less into two groups: the sale, on the one side, of consuming devices, and on the other of electrical service. By means of a diagram he sought to explain what he thought was the position. On the one side was the apparatus manufacturer, who was advertising direct to the consumer through the medium of the daily Press. He was also advertising to the wholesaler through the trade Press. That included catalogues, &c., for the benefit of the retailer. The retailer also in a small way advertised to the consumer. The manufacturer sold to the wholesaler, the wholesaler to the retailer, and the retailer to the customer. The central stations also ran their own showrooms and sold to the consumer. On the service side was the E.D.A., consisting of the manufacturer, wholesaler, and retailer and, through the medium of posters, influencing the mind of the consumer. The central station did not do that kind of thing. The central station, through the medium of the Press and circulars and so on, did its best to influence the customer, and that was the position at the moment. It was an extremely inefficient arrangement, and resulted in an enormous amount of overlapping. The advertising could be economised if the manufacturer was left to do his advertising to the wholesaler and retailer through the trade Press. There was a national kind of campaign which could only be undertaken by the E.D.A. In connection with sales, they ought to have four big weeks during the year; sales in terms of the four seasons. The central-station man after all was mainly concerned with service. The central-station man could make his appeal through the Press and in co-operation with the retailer, and in that way create a demand for apparatus. In that way they were likely to move towards standardisation.

In the ensuing discussion, Mr. Albrecht said that propaganda work was not only necessary for the public, but for the doubters within the ranks. Many were prone to reduce the matter to fine points of efficiency and cost, which were certainly not the only factors to be considered. He thought no man should engage himself in the industry unless he had the courage to use electrical apparatus. Some were faced with insurmountable difficulties, but there were others who could, and should, lend their support.

As to advertising, his opinion was that a lot of the selling value of advertising was lost because it was misdirected. More attention should be given to educating the public.

Mr. Warrilow, in reply, said that he was glad to hear that Mr. Albrecht supported him in the suggestion that electrical men should use their apparatus, and he suggested an intensive campaign towards that throughout the country. He thought it was a wrong line to try and educate the public that there was nothing to be afraid of in using electricity, and he did not think there was very much in the point. He believed that once a man became an electricity user he remained so.

Mr. Stephen Holmes said that he thought it would be found that all the big advertisement schemes originated from the manufacturer and were paid for by him. The manufacturer wanted to sell his particular goods, and the wholesaler and retailer would sell what there was a demand for, irrespective of who manufactured it. All they wanted was their profit on the turnover, and they could help to a certain extent by creating a demand for any particular line. His experience was that the man who had not a sufficient technical knowledge was absolutely useless.

Mr. Pinkney said that electric cooking was now satisfactory, and they must realise that the biggest field for development was the domestic field, and by cultivating that field they would get a big load, and then everyone in the industry would benefit one through the other—wholesaler, retailer, manufacturer, and supply company. Mr. Warrilow had said that the manufacturer bore the chief burden of advertising, but it was chiefly for himself. A great deal of advertising was done by supply authorities and the E.D.A. In his opinion too much standardisation was a bar to progress.

On the question of the speaker's diagram on the board, he thought that the manufacturer should advertise to the consumer. He did not think, generally speaking, he should sell to the consumer; he thought the supply authority should certainly provide showrooms for the consumer, and where there were not sufficient retailers available, should sell to the consumer. What they wanted to get at was the ultimate buyer, and if they were organising for selling to the consumer, it did not matter who did it.

Mr. Warrilow said that experience was contrary to Mr. Pinkney's suggestion that standardisation was a bar to progress. In America they first agreed upon the design, then the mass producer was called in. The processes were fixed and the sizes of the plant agreed upon, the machine tools purchased, and the job put in the hands of the manufacturer for, say, 100,000 articles. By the time 50,000 were made the sales campaign had commenced. He agreed that it did not matter who sold the things so long as they got to the consumer.

Mr. Wilson thought that the progress of domestic electricity was in the control of the supply companies and the contractors. They were the only people who came into contact with the consumers of domestic electricity, and the manufacturer did a great deal of the advertising. If the supply companies and contractors did the pioneering work, then the wholesalers, retailers, and manufacturers would have plenty of work to do.

Mr. Carter said that a gas company would send round and tell one exactly what one of its fires would consume and what it would cost, and he found that it worked out pretty correctly. But he did not know, for instance, whether the electrical service into his house was sufficient for heating and cooking without increasing the mains. He did not know what it would cost to install plant or to run it. If as an "electric person" it was so important for him to have this apparatus, and it was going to cost him twice as much, why should not the supply company do it for him? It was advertising, and they were out to pay for advertising, and he would advertise it for them.

Mr. Robson, dealing with the question of retailers paying their share of advertising, said he thought the amount of money spent on advertising should be in proportion to their turnover, but he did not know in their trade what that should be. The retailers had their share of advertising, but not in the technical Press. He would like to hear what was a fair percentage of turnover that should be spent in advertising.

Mr. Warrilow said he was sorry he had no figures that he could give Mr. Robson, but if the figures would be of any assistance to retailers in the district he would try to get them.

Mr. Cross spoke of the advisability of sending non-technical advertising matter to the general public; the E.D.A. recently had sent out leaflets which he thought were on the right lines for educating the ordinary user of electricity. He agreed that the manufacturers were clearly bearing the cost of advertising, and with the exception of the multiple shops, if they looked at industry generally they would find that the bulk of the advertising was done by the manufacturers. He suggested that the wholesaler and retailer should spend a fair amount on advertising, say, by circulars, and the circulars sent to the consumer should be in less technical terms. It was a nuisance to look up a circular and find, for instance, that the charge for the apparatus was not mentioned.

Mr. Warrilow agreed that the fullest information should be given to the retailer and wholesaler, but he was not sure that it was right in issuing leaflets to the public to give figures. He thought the figures were best presented by the salesman in the showroom.

Mr. Ellis said that the E.D.A. was putting out a series of leaflets and booklets which were invaluable, and he thought they should be utilised by all; scarcely any letters left any of their several firms which could not carry with them with advantage some E.D.A. matter.

Mr. Albrecht proposed a resolution to the effect that the committee should find out how many men were employed in the electrical trades in the North-East Coast and to take steps to induce them to become electrical users. This was carried by a show of hands.

THE FEDERATION OF BRITISH INDUSTRIES.

Col. Armstrong's Review of the Situation.

At the annual meeting of the Federation of British Industries, held at the Hotel Cecil, London, on December 14th, the retiring president, Col. Armstrong, reviewed the past year's trade briefly, considered the outlook, referred to industry's need of all available capital, and other matters. Having stated the factors in the prevailing situation, he asked what remedies could be suggested. We quote the following extracts from the speech:—

"The external debt which we have incurred, which we have definitely undertaken to meet, is going to impose a very heavy burden on us; nevertheless, the question of our participating in foreign loans to assist other European countries in their difficulties is freely discussed, and no question seems to be raised in regard to where the money for this purpose is to come from. Though for the moment money seems to be fairly plentiful, it must, nevertheless, be borne in mind that large sums at present invested represent the working capital of many of our industries, which, owing to bad trade, has unfortunately become liquid, and has been invested in easily realisable securities. If and when trade revives there will be a heavy and continued realisation of these investments, and a still further demand for money to finance our trade. When these conditions supervene we shall probably find that, so far from money being plentiful, the reverse will be the case, since for some time to come we can hardly look for anything approximating the large pre-war annual balance of production over consumption. We shall, therefore, be in a position of requiring for our own purposes, at all events, for a considerable period, the full amount of money available to develop our trade and our industries, and, if balance there be, I hope, to assist in a similar development within the confines of the Empire. If ever we are to regain our pre-war state of National prosperity it is obviously impossible for us to rely on the extremely narrow margin which at present exists. There are only two sources to which we can look for substantial help. The first, which will give more immediate results, is a serious and material reduction of the heavy burden of our national expenditure. It seems obvious that this cannot continue at its present figure. It may even be necessary, to tide over the immediate crisis, that the evil of some slight inflation of our currency should be accepted.

"It is, I think, now generally agreed that the policy of deflation which the Government adopted in accordance with the recommendations of the Cunliffe Committee has proceeded too far and produced results which were not anticipated at the time it was instituted. You may remember that last year we urged the Government to appoint a committee to re-examine the whole question. The Government replied that they regarded the appointment of a new committee at that time as inexpedient. I feel that the Government might do well to reconsider this decision, as, even if the same conclusions were arrived at, the present conditions are so different from those existing at the time the policy recommended by Lord Cunliffe's Committee was laid down that these conclusions need re-justification.

"The second remedy is one which more nearly concerns us, namely, that we must make every possible effort to enlarge the scope of our trade, to secure a greater share of the markets in which we already hold a footing, and that we must combine to develop new markets wherever such a course may be possible.

"We cannot afford to neglect taking any steps which may lie within our power to secure the rehabilitation of the European countries, and it is incumbent on us to do our utmost to enable them to stabilise their currencies and balance their budgets, though I am afraid for the present that anything we may do in this direction should be more on political than on financial lines.

"In regard to new markets, it would seem to be indicated that a most strenuous attempt should be made to develop them within the limits of our own Empire, where, at all events, we are dealing with kith and kin, and where we need not fear that hostile tariff barriers, unfair restrictions against our trade, and other disabilities will be imposed upon us.

"I would urge that, in the coming year, a strong committee should be asked to assemble and consider whether any joint scheme, either by individual trades or by trades collectively, can be devised to stimulate our foreign trade. If necessary, we might even invoke some support by His Majesty's Government, since assistance in such cause would in measure be reproductive, and would serve to lighten the burden of unemployment.

"I have been given to understand that we may have to look for very strenuous competition from Germany, that of late they have been perfecting schemes for collective selling abroad, and for jointly undertaking complete contracts. I am told that they have brought such organisation to a high standard of perfection, and as soon as they can establish some stability in their finances, under conditions favourable to themselves, we shall find that they have organised to our detriment.

"There is one further point bearing on foreign trade which requires prompt and energetic action, namely, the restrictions that are being imposed on us almost everywhere by hostile tariffs. In part this is the outcome of a wave of nationalism which has followed on the war, and in many instances time may prove that the duties imposed are economically unsound. Nevertheless we shall find these tariff barriers a serious impediment to the re-establishment of our trade relations.

"Meanwhile there appears to be an inclination on the part of Germany, by way of foreign investment, to resume her pre-war policy of acquiring substantial interests in industrial concerns within the limits of these protected areas.

"Gentlemen, we are in for a fight to regain our own. There are many adverse factors with which we have to contend, but I have no doubt in my mind that if only we conserve our assets and work together the time is not far distant when we shall again find ourselves approximating to our pre-war volume of trade, and a national balance sheet showing a satisfactory surplus of production over consumption."

EXPORTS AND IMPORTS OF ELECTRICAL GOODS FOR NOVEMBER, 1922.

The Board of Trade records of electrical export business for the month of November show a decrease in values of £64,207 on last month's totals, and £296,736 as compared with November last year. The figures for the month were £944,074; for October, £1,008,281; and for November, 1921, £1,240,810. The principal decreases occurred in the items for batteries, £36,000, and telegraph and telephone exports, £22,000; lower values were also recorded in the sections for electrical goods and apparatus, lamps, carbons, and electrical machinery, whilst slightly increased values are shown in the items for insulated wires and cables and meters. Electrical imports at £250,182 for the month under review show an increase of £30,000 on the total for October, 1922, and £70,000 as compared with November, 1921; an addition of £28,000 in the electrical machinery import section accounts for the enhanced values for the month. The electrical re-export figures for November were £12,355, an increase of £1,300 on October, but a decrease of £2,400 on November, 1921.

Values of Electrical Exports, Imports and Re-exports for November, 1922.

	Exports. £	Imports. £	Re-exports. £
Electrical goods and apparatus ...	123,273	52,794	2,612
Insulated wires and cables ...	179,447	17,182	—
Glow lamps	28,235	28,690	416
Arc lamps and parts	1,320	1,255	—
Batteries and accumulators ...	32,950	17,799	2,070
Meters and instruments	32,937	6,337	107
Carbons	2,967	7,030	206
Electrical machinery.—			
Railway and tramway motors ...	14,593	—	—
Other motors and generators ...	144,232	—	—
Switchboards (not telegraph or telephone)	10,690	4	—
Electrical machinery, unenumerated	137,596	72,539	6,183
Telegraph and telephone cable and material.—			
Telegraph and telephone wires and cable (not submarine)	27,325	4,673	—
Submarine telegraph and telephone cable	51,355	—	—
Telegraph and telephone instruments and apparatus	157,254	41,879	762
Totals	£944,074	£250,182	£12,355

NEW PATENTS APPLIED FOR, 1922.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Skyton-Jones, O'Dell and Swabey, Patent Agents, 265, High Holborn, London, W.C. 1.

32,729. "Combined induction and reaction coil for reception of wireless telephony." C. C. Powell. November 30th.
32,730. "Variable electric condensers, tuning coils, &c." W. A. Edwards. November 30th.
32,742. "Motor-car head lamps." H. Workman. November 30th.
32,759. "Cooling electrical apparatus." Brush Electrical Engineering Co., Ltd., and C. C. Sutton. November 30th.
32,764. "Drag magnets for electric meters, &c." British Thomson-Houston Co., Ltd. (General Electric Co.). November 30th.
32,783. "Miners' safety lamp." J. T. Whitehouse. December 1st.
32,787. "Motor-car lamp." F. Hayes. December 1st.
32,818. "Ignition plug." H. W. Bullock. December 1st.
32,819. "Electro-pneumatic locomotives, tramcars, &c." W. P. Durtnall. December 1st.
32,831. "Transformers for radio telegraphy, &c." A. Salomon. December 1st.
32,837. "Current distributors for ignition devices of internal-combustion engines." C. S. Geilgaard and C. A. Mortensen. December 1st.
32,838. "Automatic electric current regulators." W. Langdon-Davies and A. Soames. December 1st.
32,841. "Reactance coils." Electro-dynamic Construction Co., Ltd., and N. Pensabene. December 1st.
32,845. "Transformers and circuits therefor." Western Electric Co., Ltd. December 1st. (United States, August 8th.)
32,850. "Taking Röntgen pictures for medical, &c., purposes." J. F. Freund. December 1st.
32,863. "Terminals for electric conductors." N. R. Nichols. December 1st.
32,865. "Commutator device for incandescent electric lamps." J. B. Poitou. December 1st.
32,876. "Measurement of electric currents or potentials." Siemens and Halske Akt. Ges. December 1st. (Germany, December 2nd, 1921.)
32,877. "Telephone systems." B. B. Johnson and Relay Automatic Telephone Co., Ltd. December 1st.
32,878. "Telephone systems." B. B. Johnson and Relay Automatic Telephone Co., Ltd. December 1st.
32,885. "Protection of electric machines, &c., against overloading." British Thomson-Houston Co., Ltd. (Compagnie Francaise Thomson-Houston). December 1st.
32,892. "Electric power-transmission systems." A. M. Taylor. December 2nd.
32,893. "Arrangements of transformers and cables on electric transmission systems. A. M. Taylor. December 2nd.
32,894. "Electric transmission systems." A. M. Taylor. December 2nd.
32,896. "Coils or inductances for wireless telegraphy, &c." J. D. L. Bradwell and E. A. Reynolds. December 2nd.
32,910. "Mine signalling apparatus." G. Adam and J. Adam. December 2nd.
32,918. "Electric heater." C. Harvey. December 2nd.
32,944. "Transmission systems." Western Electric Co., Ltd. (Western Electric, Incorp.). December 2nd.
32,960. "Microphones." P. W. Willans. December 2nd.
32,967. "Electric control of distant objects." W. C. Jeapes. December 2nd.
32,984. "Commutator device for incandescent electric lamps." J. B. Poitou. December 2nd. (France, December 2nd, 1921.)
32,985. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd., and A. A. Pollock. December 2nd.
32,991. "Method of maintenance of constant potential difference or constant current in electric circuits." General Electric Co., Ltd., and J. W. Ryde. December 2nd.
33,012. "Electric power-transmission systems." A. M. Taylor. December 4th.
33,023. "Selenium cells." W. Prior and C. E. Riley. December 4th.
33,035. "Switchgear for electric condensers, &c." A. F. Pfeiffer. December 4th.
33,047. "Swivel headlight for automobiles." O. K. F. Hauch. December 4th.
33,052. "Joints for electrical cables." Pirelli-General Cable Works, Ltd. (L. Emanuell). December 4th.
33,055. "Electric light switches." I. Gluckstein. December 4th.
33,062. "Switching apparatus for telephone, &c., systems." Siemens and Halske Akt. Ges. December 4th. (Germany, December 3rd, 1921.)
33,066. "Electric switches." J. Lehmacher. December 4th.
33,067. "Treating incandescent electric lamps." W. J. Webb. December 4th.
33,068. "Incandescent electric lamps." A. F. Berry. December 4th.
33,069. "Automatic telephone systems." T. Lanaghan. December 4th.
33,090. "Incandescent electric lamp holder." J. B. Poitou. December 4th. (France, December 15th, 1921.)
33,101. "Electric switches." British Thomson-Houston Co., Ltd. (International General Electric Co., Inc.). December 4th.
33,102. "Systems of electric motor control." British Thomson-Houston Co., Ltd., and R. D. Given. December 4th.
33,131. "Transport electric signal lights." G. H. Henshaw and F. Rushton. December 5th.
33,132. "Push-button controllers." W. L. McLennan. December 5th.
33,140. "Method of obtaining airtight seals between molten glass and wires in electric glow lamps, &c." A. I. Hoge and A. M. Hoge. December 5th.
33,155. "Attachment to clocks to automatically switch on and off electric light at required times." A. Charsley. December 5th.
33,205. "Indicating signs for tramcars." W. J. Reynolds. December 5th.
33,210. "Plug switches." F. E. Collinson. December 5th.
33,211. "Crystal detectors, &c." R. F. Collinson. December 5th.
33,219. "Integrating watt-hour meters." J. B. Rudkin. December 5th.
33,244. "Telegraph synchronising system." D. Murray. December 6th.
33,251. "Dynamo drive for motor cycles." S. Cooper. December 6th.
33,315. "Microphone relay." C. F. Hilton. December 6th.
33,318. "Projector lamps or headlights." A. P. Collier. December 6th.
33,319. "Means for starting electric motors." W. H. Scott. December 6th.
33,321. "Wireless aerials." T. H. Gill. December 6th.
33,322. "Wireless apparatus." B. H. N. H. Hamilton. December 6th.
33,327. "Telephone and wireless receivers." J. Kelly. December 6th.
33,332. "Locking device for electric switches, &c." Luma-Werk Akt. Ges. December 6th. (Germany, December 6th, 1921.)
33,342. "Electric current meters." I. Robotti. December 6th.
33,345. "Incandescent electric lamps." Just Féle Izzólámpa es Villamossági Gyár, Részvénytársaság. December 6th. (Hungary, December 15th, 1921.)
33,350. "Spark discharge devices." R. C. Galetti. December 6th.
33,353. "Electric current controllers, rheostats, &c." J. Anderson and G. Ellison. December 6th.
33,358. "High-tension transformers." E. Pfiffner. December 6th. (Germany, December 6th, 1921.)
33,359. "Earthing choking coils or voltage transformers." E. Pfiffner. December 6th. (Germany, December 6th, 1921.)
33,365. "Atmospherics absorber for wireless telegraphy, &c." B. Quarmby. December 7th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1921.

12,464. "Thermo-electric generator of steam." G. Durando. February 27th, 1922. (Convention date not granted.) (162,628.)
14,272. "Controlling arrangement for electric current." H. Brownlow and C. A. Hadley. May 23rd, 1921. (189,156.)
15,108. "Signalling by means of invisible light rays." L. Bell and N. Marshall. May 31st, 1921. (189,161.)
17,332. "Self-induction coil." Felten & Guilleaume Carlswerk Akt. Ges. June 24th, 1920. (165,416.)
19,738. "Electro magnets." H. Lacy. July 22nd, 1921. (189,174.)
19,854. "Voltage coils for electric meters, measuring and like apparatus." E. C. R. Marks (New Antwerp Telephone and Electrical Works). July 23rd, 1921. (Convention date not granted.) (166,899.)
21,808. "Fire and burglar alarms." W. J. Luse. August 17th, 1921. (189,185.)
22,335. "Electric cord holder." W. C. Fairweather (Diehl Manufacturing Co.). August 23rd, 1921. (189,203.)
22,611. "Switches for charging batteries." A. B. Webber and Standard Time Co., Ltd. August 25th, 1921. (189,227.)
22,734. "Calling devices adapted to be operated by wireless signals." W. J. Davis. August 26th, 1921. (189,233.)
22,897. "Condensers and other electrical apparatus with electrodes immersed in a gas." American Radio and Research Corporation. August 30th, 1920. (168,882.)
23,040. "Circuit closers for electrically-operated alarm mechanisms of the thief or burglar type." G. W. Wacker. August 30th, 1921. (189,244.)
23,246. "Liquid rheostats." Metropolitan-Vickers Electrical Co., Ltd. October 18th, 1920. (170,559.)
23,469. "Combined collector and terminal block for electric ignition distributors." W. P. Thompson (Splitdorf Electrical Co.). September 3rd, 1921. (189,253.)
23,501. "Permanent magnets for magneto-electric machines." C. F. Dufaux. September 7th, 1920. (168,897.)
23,610. "Frictional driving gear for dynamo-electric machines installed on railway vehicles." Vickers, Ltd., E. C. Astington, and E. T. Flann. September 5th, 1921. (189,257.)
23,617. "Frictional driving gear for dynamo-electric machines installed on railway vehicles." Vickers, Ltd., F. C. Astington, and E. T. Flann. September 5th, 1921. (189,258.)
23,640. "Electric heating apparatus for waving or curling the hair." E. F. Suter. September 5th, 1921. (189,259.)
23,790 "Directional wireless systems and apparatus." G. P. Grenfell, J. Robinson, H. L. Crowther, T. H. Gill, and J. Erskine-Murray. September 7th, 1921. (189,266.)
23,860. "Apparatus for transmitting electric signals." G. Miaiotti. September 7th, 1921. (189,267.)
24,045. "Electrically heating wires, such as the filaments of electric discharge devices." General Electric Co., Ltd., and A. C. Bartlett. September 9th, 1921. (189,270.)
25,073. "Electric switches." F. S. Riggs. September 21st, 1921. (189,279.)
25,411. "Electrical cut-out." W. H. Illingworth. September 26th, 1921. (189,284.)
25,569. "Flux-coated electrodes for electric arc welding." A. C. Hyde. September 27th, 1921. (189,285.)
27,538. "Protected electric switches." J. Hall and New Switchgear Construction Co., Ltd. October 17th, 1921. (189,307.)
28,456. "Electrical resistances." H. Lucas, H. W. F. Ireland, and W. C. Turner. October 26th, 1921 (189,330.)
29,164. "Electric spark indicators." L. Poulsen & Co. September 1st, 1921. (186,379.)
30,337. "Electric switches." A. H. Mackley. November 14th, 1921. (189,336.)
30,599. "Holders for thermionic valves." A. P. Welch. November 16th, 1921. (189,339.)
31,014. "Electrical telephone transmitters." B. A. Pilkington. November 21st, 1921. (189,344.)
31,096. "Apparatus for overcoming the effects produced upon telegraph and telephone lines by the vicinity of single-phase currents." F. Carlos. March 4th, 1921. (176,317.)
32,066. "High-frequency transformers." W. Dornig. November 30th, 1921. (189,349.)
32,068. "Electric condensers." W. Dornig. November 30th, 1921. (189,350.)
32,321. "Electrical control systems and switch mechanism therefor." R. Amberton. December 2nd, 1921. (188,975.)
32,547. "Head lights of motor-road vehicles." J. F. Smith. December 5th, 1921. (188,977.)
33,663. "Electrical device for destroying rats." D. Marshall. December 14th, 1921. (189,361.)
33,726. "Supporting devices for electric transformers and other heavy apparatus. S. Z. de Ferranti and Ferranti, Ltd. December 6th, 1921. (188,979.)
33,960. "Electric fuse boards." Cable Accessories Co., Ltd., F. H. Reeves, and A. Crawford. December 9th, 1921. (188,985.)
34,222. "Telephone systems." Western Electric Co., Ltd. (Western Electric Inc.). December 20th, 1921. (188,996.)
34,223. "Telephone systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). December 20th, 1921. (189,365.)
34,330. "Electric switches." E. C. Strong. December 21st, 1921. (188,998.)
34,829. "Electric lamp bulb fitting." D. M. Oswald. December 28th, 1921. (189,004.)

1922.

1,356. "Insulating sheet materials." Metropolitan-Vickers Electrical Co., Ltd. January 26th, 1921. (174,593.)
1,862. "Telephone systems." Siemens & Halske Akt. Ges. January 21st, 1921. (174,365.)
5,409. "Indicator device illuminated by electricity." P. Jager. February 23rd, 1921. (175,993.)
5,836. "Regulation of polyphase commutating motors." Forges & Ateliers de Constructions Electriques De Jeumont. April 5th, 1921. (178,079.)
9,968. "Electric pocket and night lamp." P. Rombach. November 1st, 1921. (188,299.)
10,895. "Electrical pocket lamps." B. Rogge. April 18th, 1922. (189,053.)
12,070. "Electric lamp holders and switches." Wayne Engineering and Equipment Co., Ltd., and N. D. G. Robertson. April 29th, 1922. (189,060.)
14,537. "Insulator supports." L. Schmitt. May 23rd, 1922. (189,064.)
15,767. "Electric ignition devices for internal-combustion engines." Skywing Aircraft Corporation. December 1st, 1920. (Divided application on 173,308.) (181,358.)
16,104. "Sparking plugs." R. Bosch Akt. Ges. June 13th, 1921. (181,379.)
20,818. "Treatment of magnetic materials." Western Electric Co., Ltd. (Western Electric Co., Inc.). July 16th, 1921. (Divided application on 188,688.) (189,410.)
20,819. "Loaded electric conductors." Western Electric Co., Ltd. (Western Electric Co. Inc.). May 17th, 1921. (Divided application on 188,688.) (189,075.)
21,768. "Electric switches." Aktiebolaget Birka Regulator. September 30th, 1920. (Divided application on 169,696.) (184,402.)